January 1966

culture

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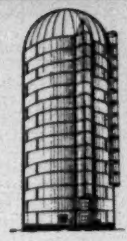

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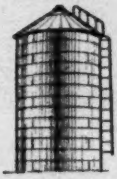

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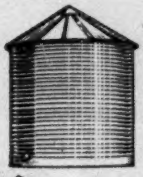

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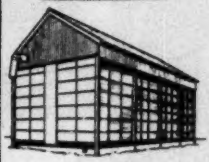

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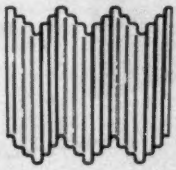

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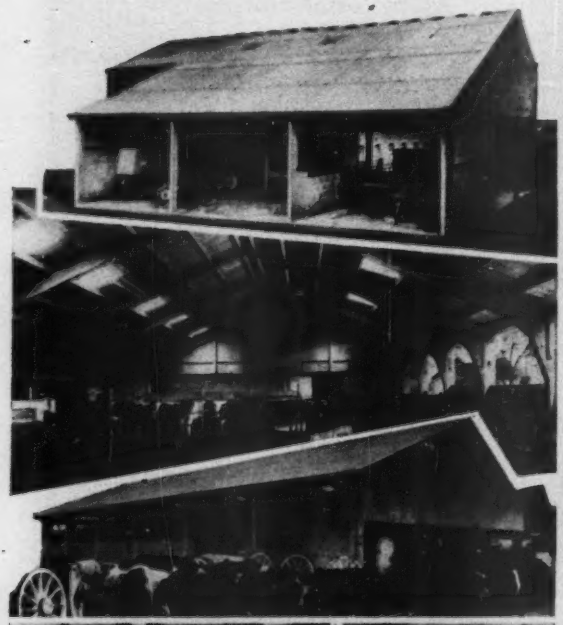

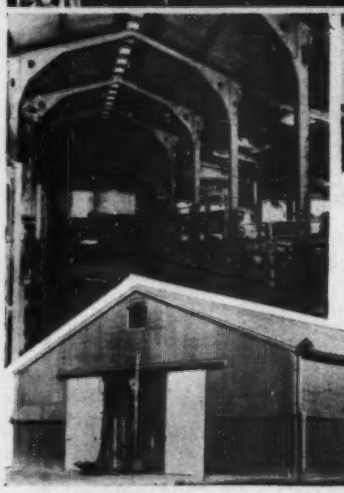

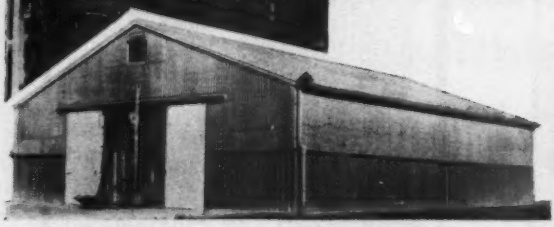

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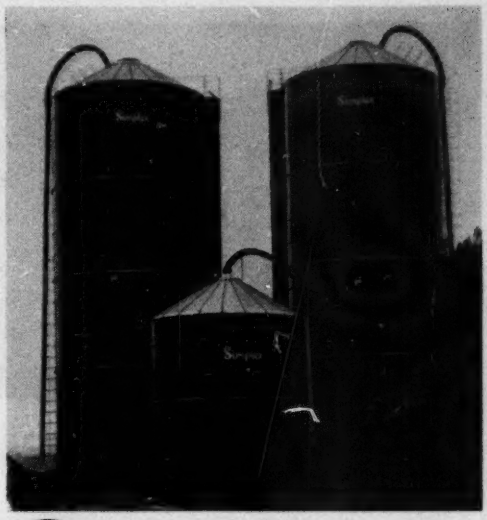

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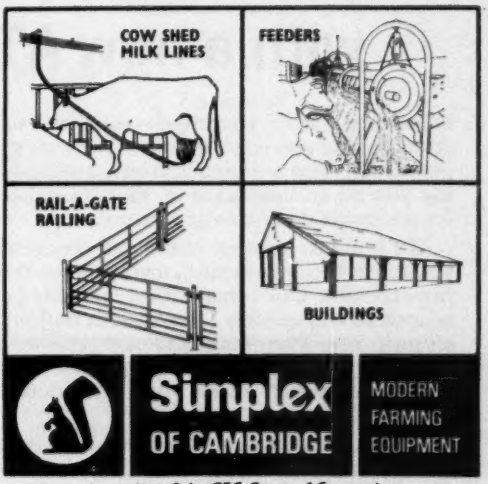

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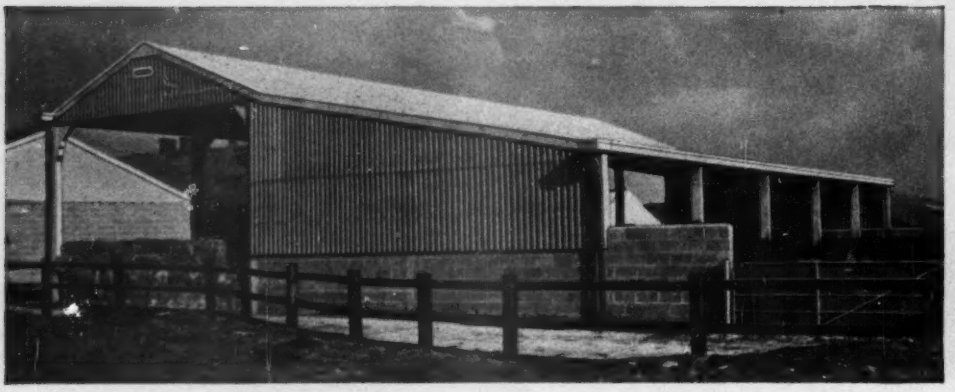

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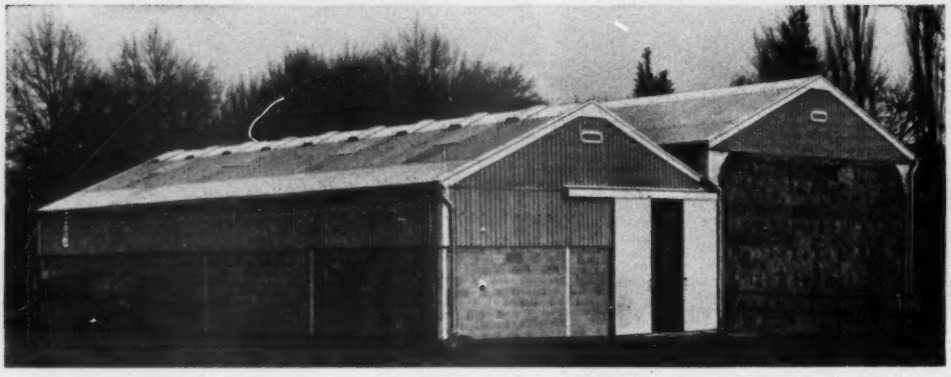

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AGRICULTURE JANUARY 1966

Mastitis

Treatment with Antibiotics

DESPITE all the research work which has been undertaken in recent years, mastitis is still a major cause of loss to the dairy farmer. At a conservative estimate the loss in milk yield alone is worth more than £8 million to the producer. This represents enough milk in pint bottles to cover practically all of the lanes of a 100-mile stretch of motorway in both directions. It is not surprising that farmers turn readily to antibiotic preparations to provide a rapid cure when they find evidence of the disease.

Every farmer must know by now that mastitis is infectious and can easily be spread from cow to cow by the hands, udder cloths and teat clusters. It is perhaps less widely known that the use of antibiotics, the most effective form of treatment, can lead to serious concern about the effect of antibiotics in milk supplies used both for manufacturing purposes and for public consumption.

Antibiotics are substances which prevent the growth of bacteria and therefore interfere with the manufacture of cheese or yoghourt if they are present in milk even at quite low levels.

Their effect on human beings is threefold. First, as a result of prior treatment a few people become sensitized to certain antibiotics, chiefly penicillin, and a very few are so highly sensitized that even the consumption of minute quantities of the antibiotic in milk will provoke an allergic response. Secondly, it is alleged that the continual consumption of small quantities of antibiotic in milk may result in people becoming sensitized and undergoing a severe reaction if they are subsequently treated with the same antibiotic. Thirdly, there is the possibility that organisms exposed to small quantities of antibiotic may develop a resistance to it so that it would be ineffective in the treatment of any disease condition associated with these organisms.

The lessons to be learned from this must surely be plain. In the first place complacency must be avoided. Acceptance by the dairy farmer that mastitis need not worry him now, and that all he needs to do is treat the infection with an antibiotic preparation and forget it, could well lead to dangerous consequences. Every care must be taken to reduce the incidence of the disease by ensuring the utmost cleanliness in all equipment and activities connected with milking. In any case mastitis is usually a herd problem and when it is suspected the vet should be called at once. And finally, where treatment with an antibiotic preparation is prescribed, the instructions for its use should be carried out to the letter, and every precaution taken to ensure that milk supplies do not contain antibiotics.

A misty morning's drilling in the West Country

(set up by Fisons on a sunny day at Levington)

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A comparison of two systems of making and using silage

Tower or Clamp Silos?

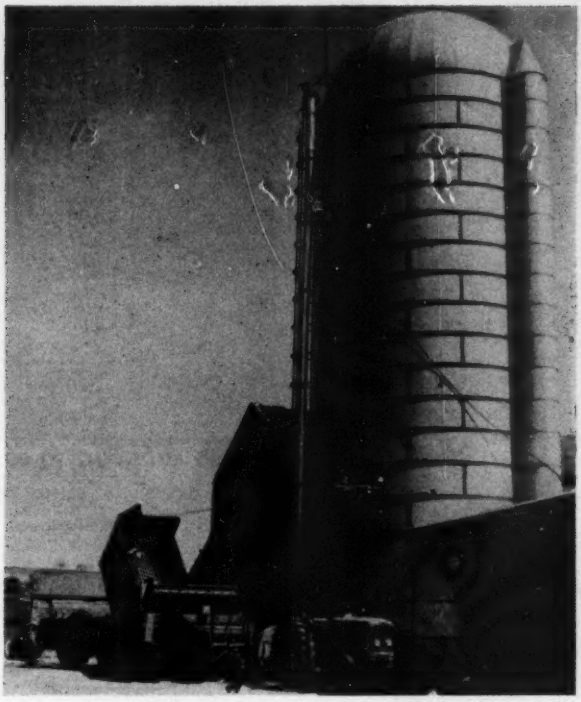
J. N. Addison and E. H. Joce

DURING recent years agriculture has been changing and developing in many ways. New ideas and techniques tend to create a demand for specialized buildings and equipment. The re-equipping of farms is also encouraged by the financial assistance which is made available under various grant-aid schemes. It is essential, however, that estate and farm management decisions should be based on the economics of complete enterprise systems. Fixed equipment is only part of the picture. Different husbandry techniques often appear to be competitive with each other, and it is not always easy to reach a decision, especially when the effect of scale radically alters the economic viability of some of the alternatives. Methods of fodder conservation are a case in point: changes in method can be small and involve only marginal expenditure, or they may be large and involve considerable expenditure on fixed equipment.

This article is based on a recent three-year study (1961–64) which was made of the grass conservation systems on two Northumberland farms under the same management. Farm A had tower silos and auger feed, and farm B had clamp silos and self-feed. Where possible, work study techniques were used to provide data.

The two systems

Farm A was a 700-acre dairy and mixed farm with a loose-housed dairy herd of 110 cows and 150 young stock. About 120 acres of grass were ensiled for the dairy cows each year. The grass was crimped, wilted to 40–50 per cent dry matter, and then it was chopped and blown into two 50 ft × 20 ft diameter tower silos; from these it was taken by top-unloader and auger, and fed into the covered yards. Farm B was a 360-acre dairy and mixed farm with a loose-housed dairy herd of 55 cows with 60 followers. About 90 acres of grass were ensiled for the cows in a 50 ft × 75 ft clamp silo. The grass was forage-harvested and buckraked into the silo from which it was self-fed. A similar type of grass seeds mixture was used on both farms,



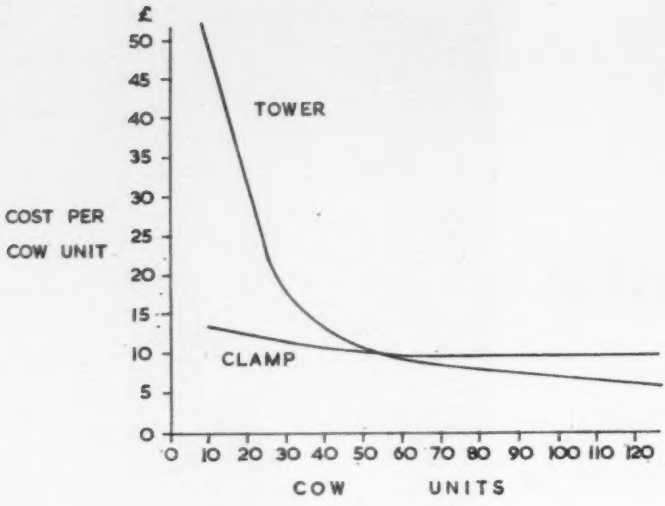
This photograph of a tower silo on farm A also shows the type of unloading equipment used in the first year of the study

and the yield of green material per acre was substantially similar on each farm. A substantial proportion of the loads was weighed on jacks or on a public weighbridge. This was checked by weighing small areas of the growing crop. The pattern of operations also included the sampling for dry matter of every load of wilted material for the towers and every second load of fresh grass for the clamp.

The object of the investigation was to examine the cost of making and feeding silage, in each case including the cost of providing the silo structure, feeding apparatus, machinery and labour; and to assess, if this should prove possible, at what point one system was more preferable than the other. An average of 450 tons of wilted grass was ensiled on farm A, and an average of 700 tons of fresh grass on farm B. Only dairy cows used the silage from the silos concerned. The acreage required for conservation purposes per cow unit was found to be one acre on farm A and in excess of 1½ acres on farm B.

Capital investment

The capital investment for silos and machinery on farms A and B was, respectively, £65 and £85 per cow unit. The mean annual conservation cost per cow unit, excluding the acreage advantage for farm A, was £11·1 and £9·9 respectively. Taking the rent at £7 and the grass crop at £9·5 per acre, the ½ acre 'saved' by the tower system is worth about £8 per cow unit. In 1964, the cost per cow unit was £28 on farm A and £36 on farm B. The average quantities of grass ensiled per cow unit was about 4½ tons of wilted material on farm A and 13 tons of fresh grass on farm B. The average total capital, labour and machinery costs were, respectively, £2·5 and £0·75 per



ton of forage material hauled to the silo. In terms of dry matter this is approximately equivalent to £5·5 (farm A) and £3·8 (farm B) per ton of dry matter put into the silos. These costs are subject to variation due to the scale of enterprise and to the difference of about ½ acre per cow unit in land requirement.

Taking all these factors into consideration, the results from farms A and B were used to calculate the cost per cow unit under both systems with cow units of 25, 55, 75 and 110. The calculated cost per cow unit at each size of enterprise produced curves which break even at a point between 50–60 cow units (see graph). This suggests that the tower system is more economical beyond the break-even size of enterprise. In 1964 the silage was wilted on farm B, and some of the figures relating to that season could not therefore be used in the study; this limited experience suggested, however, that wilted clamp silage would be intermediate to the two systems examined here and that, if the 'wilted in clamp' silage was being compared to 'tower' silage, the break-even point would occur at a larger size of unit.

The type of unloading equipment used on farm A in the third season

Clamp silo on farm B

Quality

The quality of silage made on both farms was good, and maintenance plus 1½ gallons with protein in excess was consistently obtained from the silage in each case. The daily allowance of silage per cow unit was 45–50 lb on farm A and approximately 100 lb on farm B. The bulk food requirement in each case was of the order of 2 tons of dry matter per cow unit per winter season of 180–200 days. A proportion of the food value of the grass was lost during the ensiling process. During this study, dry matter losses in the silo on farms A and B were of the order of 5 per cent and 20 per cent respectively. The losses of feeding value in the form of starch equivalent in typical silos of types similar to those on farms A and B are, respectively, 10 per cent and 30 per cent.

The investigation showed that the capital cost of the towers and the mechanical equipment on farm A was justified from both the landlord's and the tenant's point of view, and also indicated that with mechanized feeding, as on farm A, the factors which most strongly influence performance are the dry matter percentage of the material and the fineness of chop and evenness of filling. This is reflected in the labour and fuel costs for feeding, which varied from under 4*s*. to over 8*s*. per ton. On farm B, the labour and fuel costs for self-feeding were about 6*d*. per ton of settled silage. The use of work study principles has enabled labour and machinery performance to be improved considerably on farm A. The man-hours have been reduced by 35 per cent and the cost of labour and power by 57 per cent for the sequence of operations from cutting green to putting wilted grass into the silo.

Tower capacity

Tower silos are available in a range of sizes and are constructed mainly of steel or concrete. In general, as silos increase in size the cost per cu. ft of storage is reduced. There are numerous methods of estimating the capacity of tower silos, and in consequence a wide range of tonnage figures may be quoted for silos of a given size. This is reflected in the cost per ton of dry matter stored. The main factors which influence tower capacity are:

1. Degree of wilting.
2. Height of settled silage.

The investigation suggests that the maximum dry matter capacity of grass silage in the tower silos was achieved by wilting to about 40 per cent D.M. The settled height of silage was approximately 46 ft (in 50 ft towers). Under-wilting produces effluent with the consequent lowering of efficiency. Over-wilting limits capacity and is therefore expensive. In addition, drier material gives trouble with unloaders and, if very dry, over-heating may occur. Assuming the dry matter of the material is constant, the greater the height of settled silage, the greater the density and therefore the greater the tonnage stored. It follows that silos should be as high as possible. A satisfactory rate of filling for towers is 10 ft per day; 6 ft per day may be regarded as the minimum to avoid over-heating. Unloading should be carried out at not less than 3 in. per day. It should be noted that the effect of wilting is to reduce the amount of deadweight to be hauled. This is particularly advantageous where large trailers or special high-side conversions are available.

Where the unit is sufficiently large, the greater efficiency of conservation in the tower system results in a saving in land requirement. However, with small units the cost of the tower system is disproportionately high. In comparing the conventional clamp with tower system, this study indicates that the use of tower silos can be given serious consideration when the herd size approaches the equivalent of 60 cow units. It also shows that the conventional clamp silo and self-feed system can be extremely efficient for small herd sizes.

The joint authors of this article are **J. N. Addison,** of the Agricultural Land Service, Newcastle upon Tyne, and **E. H. Joce, N.D.A.,** of the National Agricultural Advisory Service, Newcastle upon Tyne. The full results of their study are given in Comparative Study No. 2, *Conservation and Storage of Grass*, issued by the Ministry's regional office, Newcastle upon Tyne, in April, 1965.

TRACTOR DRIVING IN ICY CONDITIONS

The worst winter weather has probably yet to come and will bring with it added risks to those who have to be about in all weathers. Tractor drivers in particular need to take great care when surfaces are slippery with frost, ice or hard-packed snow, and the following precautions are advised:

1. Check brakes, tyres and steering. They need to be in first-class order —in any weather conditions!
2. Drive slowly and use steering, clutch and throttle gently. Tractor driving at speed is always dangerous; in winter it can be disastrous.
3. Reduce the weight of loads. The heavier the load the more likely you are to run into trouble.
4. Do not hitch above drawbar level.

The Farm Business Recording Scheme

Albert J. Davies

FARMING is a business and it should therefore be judged by the same basic commercial standards as any other industry. This means having sufficient information about the business; how it is developing, which part of it is contributing to, or depressing, profits. How can it be expanded economically in a competitive age? Are all the resources fully utilized? If not, why not? These are aspects which management must know about in any business, and it applies with equal force to the commercial farmer whose income and standard of living depend on the financial success of his farming. Modern farm business management has four stages. These are: the keeping of records, examination of these records, planning future action and, last but by no means least, checking performance against the plan.

Broadly speaking business records serve two functions. The first is to show at intervals, usually annually, the results achieved within the business in management terms to the owner, shareholder or the Inland Revenue. This is the traditional function of trading accounts and even today many businessmen believe this to be their only purpose. The other and by far the most important use is as an instrument in the planning and running of the business. In other words, an efficient system of recording or costing is an essential part of management under modern conditions of business. The essential difference between the two functions is that the first is a record of past performance, whilst the second concerns itself with the present and the future. Farm records should therefore be designed and maintained with the correct type of record in view, namely to help plan and control the business.

Yet all available evidence suggests that only about ten per cent of those engaged in farming in this country keep sufficient records concerning their whole farm business which will enable them to make sound management decisions. This situation has retarded, and continues to retard, the adoption of modern management aids and techniques. Hence the recent introduction by the Ministry of Agriculture, Fisheries and Food of a pilot scheme to try to stimulate greater interest in recording essential management information within farm and horticultural businesses.

The object of the Scheme

The object of the Scheme is to make grants available to farmers and growers as a help towards the cost of employing a record-keeping business to prepare records for them. A pilot scheme was introduced on 1st November, 1965, to cover the counties of Cheshire, Norfolk, Staffordshire and the East Riding of Yorkshire. From that date farmers or horticulturists with holdings in these counties who are not participating in the Small Farm (Business Management) Scheme and whose holdings have a standard labour requirement of 250 standard man-days or more will be eligible to take part in the Scheme. It is the intention, after a year's experience in the pilot areas, to extend the Scheme as quickly as possible to other parts of the country.

To qualify for the grant, the records will have to be kept by record-keeping businesses which make their services generally available to farmers for a fee. These can include, for example, businesses set up for the purpose of keeping farm business records, professional accountants, and farmers' co-operatives that provide record-keeping services for their members. Grants will not be payable for records kept by the occupier of a holding or an employee or a member of his family. Furthermore, only one grant may be made to a farmer or grower even though he may operate more than one farming or horticultural business.

Rate of grant

The basic rate of grant for records which have been properly kept and summarized on the appropriate management summary forms will be £70 per year. In addition, a further grant of £30 per year will be payable whenever a farmer is required to have records prepared showing the allocation of feedingstuffs between the different livestock enterprises on the farm. One of the weaknesses of so many farm business records is that there is insufficient information about the quantity and cost of food consumed by different types of livestock. Because of this it is often impossible to assess the profitability or otherwise of individual livestock enterprises. Allocating feedingstuffs, particularly when they are home-grown, is time consuming, and as this is so vital on the livestock farm, the additional grant payment has been provided. Grants would normally be available for three successive years.

How the Scheme works

A farmer or grower, having agreed with a record-keeping agency to carry out the work, will apply in the usual way to the Ministry's divisional office. He will be told whether he is eligible and, assuming this to be so, his local advisory officer (i.e., agricultural or horticultural) will discuss with him what type of information has to be kept to obtain the grant in the first year. The information required will fall under three broad headings:

Financial records sufficient to allow the preparation of an annual costs and returns statement which, along with certain physical records, can assist in making management decisions.

Physical records, such as cropping, stocking and the allocation of feedingstuffs.

Enterprise records, such as details of the variable costs and gross output within each enterprise, which will enable the relative contribution of individual enterprises to the holding's overall economy to be measured.

The recording agency will keep the records and submit them at the end of the period on the appropriate management analysis summary forms. Assuming that they are accurate and provide the information as agreed by the advisory officer, then the farmer or grower will be paid the appropriate grant. It should be stressed here that the records and other financial information concerning any farm business which are submitted in applying for payment of the grant will be treated in strict confidence by the N.A.A.S. officers concerned.

Use of records

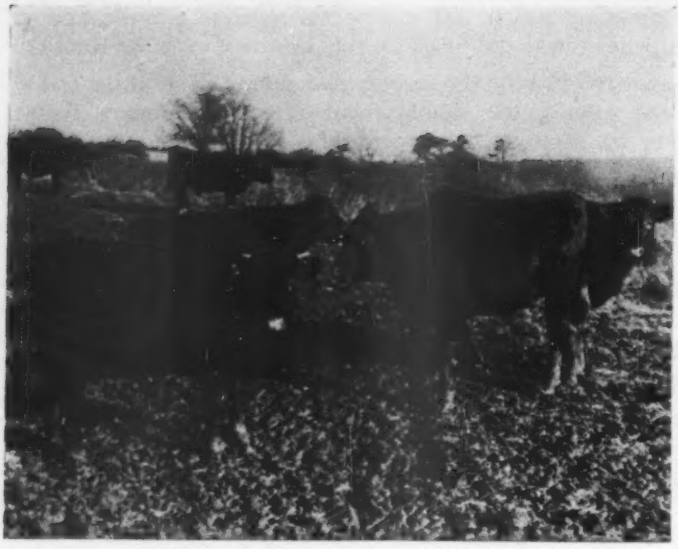
Although a recording agency or an accountant may be recording the physical and financial data about any business, every individual farmer or grower must provide this information in some form or another and should make the necessary arrangements to see that this available. Physical records such as numbers of stock, acreages of crops, allocation of different feeding-stuffs to the appropriate enterprises, will have to be kept in the first instance by the owner of the business or he should arrange for it to be done by one, or even more than one member (in the case of a large business), of his staff.

Records in themselves are meaningless; they should be kept for a purpose, namely, to plan and improve the profitability of the business. This means that they should be interpreted from the management standpoint and appropriate action taken. It is not a prerequisite of the Scheme that every farmer or grower who participates should seek advice on how best to use the information collected. It is hoped that the large majority will do this because one would expect this to be in their own interests. And after three years of grant it is hoped that the benefits of adequate business records will be sufficiently clear for farms to continue recording.

Experience to date, in the pilot areas, suggests that there is no shortage of recording agencies. Nevertheless, when the Scheme is expanded this may create a problem, but this is something which educational and other authorities throughout the country are tackling with vigour.

Today technical competence and high standards of husbandry are by themselves insufficient in modern farming; to them must be added good record keeping and all those other aids which are essential to making correct financial decisions. The Farm Business Recording Scheme is meant to stimulate this activity.

This article has been written by **Albert J. Davies, B.Sc. (Agric.)**, who is Chief Farm Management Advisory Officer of the N.A.A.S.



Spring-born single-suckled calves out-wintered on easy-feed silage plus 4 lb rolled barley per head per day

Beef off Grass

M. Hastings

LISCOMBE Experimental Husbandry Farm lies on the south-east edge of Exmoor where the traditional farming of the area consists of spring-calving suckler herds of Devons together with the Exmoor Horn and Close-wool breeds of sheep. A rainfall of 60 inches and the high humidity of this upland area prevent arable cropping seriously competing with beef and sheep production, but they do produce abundant grass under good management. Fairly intensive use of grassland by rotational grazing and adequate manuring has maintained high production from permanent pastures and old leys. This has minimized the need for reseeding which is particularly costly where little or no arable crops are grown.

Due to high rainfall and humidity, conservation of winter food is difficult, and at Liscombe is mainly in the form of ensilage. Silage-making has also aided intensive management and produced quick aftermaths. It is under this system of farming that the value of grazing and silage for beef production has been investigated. The farm carries a herd of spring-calving Devon suckler cows; the suckled calves weigh some 4–5 cwt at the beginning of November when winter feeding becomes necessary.

In an attempt to obtain sufficient numbers of calves to study the principles of winter feeding of young beef animals, it was decided to rear week-old purchased spring-born calves at grass through the summer on a system similar to that developed at the Grassland Research Institute.

These calves, born in February-March, enter the winter in November weighing from 3½–5 cwt dependent upon their management and stocking rate. Investigations into their ability to cope with high roughage rations in their first winter have shown them to have a marked superiority over single-suckled calves in this respect, so much so that the two types of animals require quite different management. Thus, the work on grass-reared calves has not shed a great deal of light on the problems of suckled calves. However, beef production from the national dairy herd is so important that the investigations have been rewarding.

Rearing to six weeks

Week-old calves, Charolais × Friesian, Devon × Friesian and Hereford × Friesian, have been purchased in late February to early March. The system of rearing all purchased calves is similar, and employs milk substitute at the rate of approximately a gallon a day for six weeks. The calves are offered an early-weaning concentrate mixture from the time they arrive on the farm. Calves are weaned at six weeks provided they have sufficient bloom, weigh 140 lb or have gained at least 30 lb since arrival. The usual rate of gain during the first six weeks is in the region of 1¼ lb per day. During the past two years automatic rearing machines have been used quite successfully.

After six weeks

The calves, when weaned, continue on early-weaning mixture with hay or silage, and as soon as sufficient grass is available and the weather is mild, they are turned out to grass. They are usually between 6 and 10 weeks old at turn-out and continue on concentrate for 2–4 weeks until they weigh 200 lb. The calves then continue on grass alone until the autumn. The usual

Devon and Charolais × Friesian calves, born February/March, grass-reared at 7 months old

March-born, grass-reared 18 month Devon × Friesian steers, wintered on silage plus 3 lb rolled barley per day

stocking rate is 4 calves per acre with an average liveweight gain of over 1½ lb per day; the fertilizer usage is around 180 units of nitrogen per acre, together with adequate phosphate and potash. In addition to the grazing, approximately 3 tons of grass for silage is taken. Parasitic worms are controlled by ensuring that the young calves do not graze land used by adult cattle in the previous year or by sheep in the previous six months. Dosing with anthelmintics is used only when there are signs of poor performance and not as a routine measure. One 7-acre field has been used solely for rearing calves for five years. Only now are there signs of any appreciable worm burden developing.

The costs which can be directly attributed to rearing calves under this system are:

Items	*Approximate cost per calf* £ s. d.
Food:	
½ cwt milk replacer 2 cwt concentrate good-quality hay or silage	7 10 0
Pre-weaning vet. charges	10 0
Fertilizer (4 calves per acre)	1 0 0
Post-weaning vet. charges	6 0
	9 6 0
Additional costs with automatic machines	
Depreciation	13 6
Spares and service	2 6
Electricity	2 0
	18 0

Uses of grass-reared spring calves

At Liscombe, the spring-born calf has been used to produce a 12–14 month finished animal or an 18–20 month fat beast or forward store. The stocking rate, grazing management and potential of the calves determines

their performance at grass during the first summer. Experience has shown that calves grazed at 4 per acre will gain at 1½ lb per day to produce an animal weighing some 440 lb at the end of October. At this stocking rate, a three years trial showed no economic benefit from feeding either rolled barley or barley with protein supplement. Stocking at a lower intensity of 2 calves per acre, but conserving far more silage, permitted an average daily liveweight gain of 2 lb per head with an end of October weight of around 540 lb.

The majority of the spring calves at Liscombe have been reared at 4 per acre and used to investigate their winter management for sale at 18–20 months fat or as forward stores. The winter diets which have been compared over a three-year period are silage alone, or with 3, 6 or 9 lb of barley. Silage alone has given liveweight gains of 0·7 to 1·3 lb per day, dependent upon the silage quality; feeding 6 lb of barley in addition has given liveweight gains of 1·4–1·9 lb. The performance, when turned out to grass the following spring, has been in the reverse order; those cattle which wintered hardest, on silage only, gained most weight, and those wintered on the highest rates of barley showed lowest gains. The final weights of these cattle in mid-August have only differed, on average, by approximately half the difference obtained at the end of the winter, and in two years out of three the cost of feeding 6 lb of barley in the winter has not been repaid by sufficient liveweight increase in mid-August.

It is difficult to formulate a definite feeding policy since silage differs so much in quality. As a general guide, the winter liveweight gain per day should be in the region of 1–1¼ lb for a beast starting the winter at 400–440 lb, and moderate-quality silage with 3 lb of barley will produce this performance. Most of the cattle produced under this system have been sold off as autumn stores. The stocking rate during the second summer was 2 beasts per acre. When good silage is fed in the winter, and this is combined with a good grazing summer, then a proportion go fat.

Since silage quality appears to determine the amount of cereal supplementation which is needed to obtain an adequate winter liveweight gain, grass which had been ensiled, fresh or wilted, was compared last winter. When silage alone was being fed, there was a slight advantage from wilting; however, when fed together with 3 or 6 lb of barley, wilting did not appear to be beneficial. This work is continuing, and both the maturity of the grass when ensiled, and the final dry matter percentage of silage, are being investigated. The advent of vacuum compressed silage, with minimal waste and even fermentation, may allow the full potential of young grass to be stored for winter use.

Earlier purchasing

A possible further improvement to the system has been obtained this year by earlier purchasing of calves, i.e., in January. Their growth during the summer has been excellent and they will enter the winter weighing approximately ¾ cwt heavier than February/March calves. It appears that, given reasonable winter performance, the majority will go fat from grass next September at 20–21 months of age.

Winter fattening of spring calves to produce 12–14 month beef has also been investigated in two different ways. First, the lighter animals which have been reared at 4 per acre, and weigh approximately 350 lb in October,

Devon × Friesian calves, born February/March, turned out to grass at 6 weeks, with concentrates at 3 lb per head per day until 12 weeks

have been fattened through the winter on Rowett-type rations only, or with silage and 9 lb barley followed by a final Rowett ration. With the second ration the animals ate two tons of silage, costed at 30*s.* per ton, and took some 7–8 weeks longer to finish. However, the difference between sale price and cost of food was greater by £6 10*s.* per beast.

The second system of fattening spring-born calves has been the use of high-quality silage for calves grazed at 2 per acre. A small-scale study is now in its second complete year. The animals have gained approximately 2 lb per day while at grass, and enter the winter at 520–540 lb. Enough high-quality silage to fatten the animals is also produced from this acreage by liberal fertilizing. In an initial observation year, selected calves on very good silage continued in the winter at 2 lb per day. Last year only moderate silage was produced, and during the winter 6–9 lb of Rowett mixture had to be fed to achieve 2 lb per day. Furthermore, two of the twelve calves died from scours and blackleg. However, even with these misfortunes, a gross margin of £49 per acre was obtained when the animals were sold weighing 8 cwt at 16 months. This gross margin figure does not include fixed costs, nor establishment costs.

Single-suckled calves

Reference has already been made to the superiority of cross-bred grass-reared calves over single-suckled animals when tackling high-silage diets in winter. In a trial comparison of the two types of animal, the grass-reared cross-breds ate approximately 35 per cent more silage than single-suckled Devon calves. The latter needed 6 lb of barley per day to approach the winter performance of grass-reared Devon × Friesians being fed silage alone.

The reason for the inability of single-suckled animals to cope with large quantities of silage is unknown. Their management before and after weaning,

prior to wintering, is to be investigated. As a preliminary trial to find out the relative importance of breed and method of calf rearing, both Devon and Devon × Friesian calves are being reared at grass and by single suckling, and the winter performance of these animals on silage will be studied.

Future work

The grass-reared purchased calf is applicable to both upland and lowland conditions. The studies already carried out on this system have shown the reduction in rearing costs which are possible by the efficient use of grazing and silage. In addition to continuing this work, the emphasis will swing back to suckled calves—traditional upland stock. Cross-bred cows are already rearing their first calves and will be compared with the pure-bred suckler. Probably the major factors in improving profitability from single-suckled animals are increases in stocking rate of the suckler cow, together with improved management to obtain higher weaning weights and winter performance. To make this possible, improvement in grazing management and developments in grass conservation will need to be thoroughly explored.

The author of this article, **Michael Hastings, B.Sc. (Hons.)**, is a N.A.A.S. officer at the Liscombe Experimental Husbandry Farm, near Dulverton, Somerset. He has previously worked at the Welsh Plant Breeding Station and at Bridget's Experimental Husbandry Farm in Hampshire.

New Service to Agricultural Engineering Industry

A 'Component Failure Investigation' service has been started at the National Institute of Agricultural Engineering to enable a manufacturer who is investigating the cause of failure of a component in an agricultural machine to draw on experience accumulated in the course of machinery testing and research and on the facilities available at the Institute, The work done by the N.I.A.E., which is on a confidential basis, can include laboratory examinations, calculations, and possibly rig testing, but any extensive field tests or collection of information about machines in service will normally be carried out by the manufacturer. A consultation fee will be charged for the initial examination, which will be based on written evidence and samples supplied by the manufacturer. If further work is needed, a programme and cost estimate will be agreed between the manufacturer and the Institute.

The first of two articles

by **F. E. Shotton**

Potato Growing in the Netherlands (1)

PERHAPS the most striking thing about a conducted inspection of potato-growing farms in the Netherlands is the size of the farms one visits. In May, 1965, I visited one large farming estate of 3,000 acres and in the following September I passed by another large estate, but otherwise the farms visited were all between 100–150 acres, or occasionally up to 200 acres. That there should be small farms in a densely-populated and fertile country is not in itself surprising, but that farms of this size should be initiating new techniques and, in association with small local engineering works, developing the sophisticated machines which are the basis of the new techniques, certainly is of great interest.

The opinion was expressed to me by one of my hosts that it might be the smallness of the farms which has occasioned the marked mechanical development which one sees everywhere. A small farmer who does his own work benefits from good mechanization in two important places—his back and his pocket. Not only is the machinery good, it is also very well looked after and a set of inter-row harrows and ridging bodies, when not in use, will be taken to pieces, oiled and put away up in the loft of one of those enormous brick barns which are so characteristic of rural Holland and are so different from the things which we know in England as 'Dutch barns'.

Specialization

Small farmers in the Netherlands are mechanically minded and careful, and with very few exceptions are specialists. Agriculture in the Netherlands is divided into districts and it is rare to see two types of farming cheek by jowl. For a mile or two one may drive through pasture lands grazed by black and white cattle and divided by dykes (the English fenland word meaning ditch) which are level full and serve as field boundaries and watering places. Suddenly, the scene will change and one has entered the arable farming area where the crops are potatoes, sugar beet, wheat, barley and perhaps a little flax, peas or lucerne. Normally no grass and no livestock, not even pigs—and so no farmyard manure—are found on the arable farms. South of Rotterdam onions are grown as a farm crop and in the Wieringen-meer Polder daffodils and tulips occur occasionally among the wheat and potatoes. But the great mixture of crops, arable and horticultural, which occurs in the Fens of Lincolnshire and East Anglia is not evident within one district in the Netherlands. No doubt that is another reason for the high level of mechanization. Specialization on relatively few crops exists both on farms and in districts.

This specialization has another important aspect. In the grassland areas fields may be of irregular size and shape and the water level is kept high. In arable districts, however, fields appear to be always of regular shape—frequently long and narrow—and the water table is kept low both winter and summer. I cannot recollect seeing a single 'scoot', 'gore' or awkward corner, and this handicap to advanced mechanization, so common on smaller farms in England, does not exist in the Netherlands.

All these things, and also the co-operatives, are of importance and should be borne in mind when thinking of potato production in the Netherlands. It has been said that 'God made the World but Dutchmen made Holland'. In so far as this may be true, it has relevance to the modern technique of potato growing.

Soil types

Well-laid-out fields do not occur by chance. Nor, in the Netherlands, is soil type solely Nature's responsibility. Leaving aside the new polders which were artificially made from the Zuider Zee, the soils used for potato growing in the Netherlands today have been carefully selected. Heavy, intractable soils are either under grass or grow other crops. Peat and sand do grow potatoes but only for commercial alcohol production and not for human consumption. The 'clay' soils of Holland seem rarely as heavy as their name implies. A difference in soil classification between the Netherlands and England explains in part this confusion of terminology. There are limited areas of heavy soil (silty clay loam and even silt loam) growing potatoes, but these are often used to grow seed which is lifted early. The usual run of soils used for 'consumption' potatoes are light or medium-silts (very fine sandy loam to silty loam) which are quite free from stones and not sharply abrasive. They are soils which very many British potato growers would prefer to those with which they have to contend.

Having satisfied these conditions of soil type, field shape and good drainage, the actual cultivation of the potato crop starts on some farms in the spring of the previous year when the cereal crop which is to be followed by potatoes is undersown with clover or Italian ryegrass for green manure.

The almost complete absence of farmyard manure has been noted, yet I have some difficulty in understanding why the green manure crop is grown. To some extent it may be the expression of a wish to replace the missing farmyard manure though no one in fact said this to me. Whatever the intention I doubt whether this is its function, as the swing appears to be away from legumes and towards grass. I think these 'fertility leys' may be of value for the action of the grass roots in stabilizing crumb structure and thus providing better conditions of tilth for the potato crop. The growing season from corn harvest in August until the land is ploughed in October is barely long enough to create a worthwhile addition of organic matter, though the crop would take up and hold some nitrate nitrogen which might otherwise be lost.

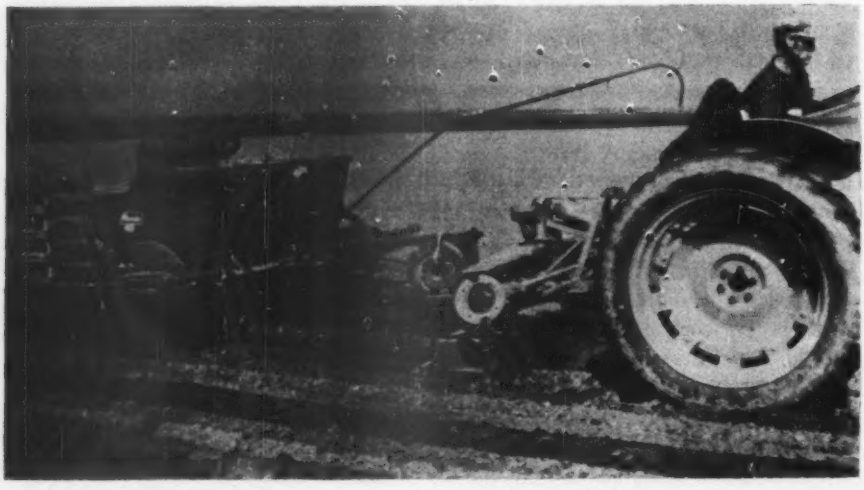
The October ploughing is to a depth of about nine inches. Deeper working is thought to be of no benefit and to waste time and fuel. The furrows are laid reasonably flat so that they will weather to a level surface in spring without high crests and valleys. If the ploughing is considered too rough, the land may be cultivated in such a way as to level off the crests of the furrows during frosty weather in December or January, always providing that the tractor tyres will run clean and cause no compaction.

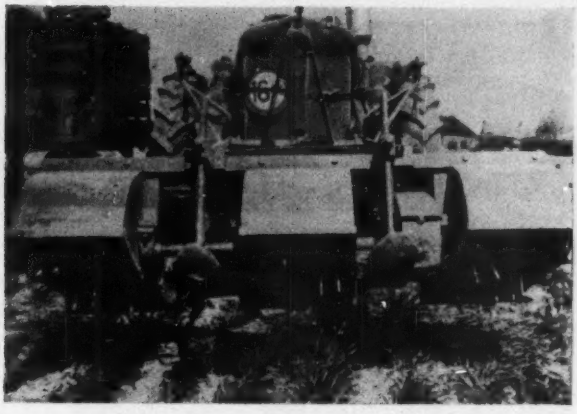
Fertilizer is invariably applied broadcast to the weathered plough furrow during the early spring and is entirely divorced from the operation of planting. Fertilizer rates appear to be broadly comparable to those used on similar soil in England, though nitrogen rates may run as high as 160 units per acre for 'consumption' potatoes and rather less for seed crops.

Spring cultivations

The spring cultivations prior to planting vary considerably in detail but little in principle. As far as I could determine a cultivator is never used. In the area south of Rotterdam harrows working to a depth of three to five inches appear normal. They may be either of the traditional zig-zag type or, on some farms, these are being replaced by the power-driven harrows. The latter have four rows of tines, the first row working to a

A 3-row planter hitched in tandem behind a 3-row rotary cultivator planting immediately on to the weathered plough furrow without previous spring cultivations





Another type of rotary cultivator, fitted in front of the tractor. In this case the planter is fixed behind

depth of 3–4 inches and the following rows somewhat shallower; all are driven in a reciprocating manner across the direction of forward travel. These tools can produce a very fine tilth to the depth of working when used under the right conditions of soil moisture.

Further north, in the polders round the Ijsselmeer, harrows or power harrows may be used but there is a notable development of rotary cultivators which work merely the tracks in which the potatoes will be planted. Two, three and four row models exist. The inter-row spaces are left undisturbed, or the wheel marks only may be pulled up with two small harrows running behind the tyres. With one of these machines the width of the worked track is only 30 cm (12 in.) out of the row width of 66–75 cm. Subsequently, by adjusting the width of the tractor wheel tracks these cultivators are made to till the inter-row spaces, and small ridging bodies are fitted behind to build up the ridge.

The principles involved in spring working are:

1. Start with reasonably level weathered plough.
2. Do not go on it until it is really fit—last year for many farmers this meant waiting until after mid-May.
3. Keep the frosted tilth on top.
4. Work as deep as the tilth will permit (this may be deeper than stated above) but do not work down into wet or unweathered soil and make clod.
5. Plant immediately, i.e., work just ahead of the planter.

All these principles are understood on the silts of the English fens but are not always observed as religiously as in Holland. The Dutch have perfected the difficult business of keeping cultivations and planting in step by mounting both the rotary cultivator and the planter on the same tractor, either the one in front and the other behind the tractor, or both in tandem behind. Such an outfit needs a rather wide headland, but this presents no great problem if the potato field is long and narrow. Some potato headlands are sown with barley, like sugar beet headlands in this country.

(In a subsequent article, to be published next month, Mr. Shotton will describe the Dutch methods of planting and harvesting potatoes seen during his visit.)

The author, **F. E. Shotton, M.A., Dip. Agric. (Cantab.)**, has been Director of the Terrington Experimental Husbandry Farm in Norfolk since 1961. During 1965 Mr. Shotton made two visits to the Netherlands to study their potato-growing techniques.

Teaching Estate Work at a Farm Institute

H. Davies

A common feature of many farm businesses is the almost continual demand for renewed capital investment to increase output or increase efficiency. Much of this capital is required for improving existing or providing new fixed equipment. The proper functioning, initial cost and investment return will largely depend on how well the various technical problems, usually associated with these works, are solved. For this reason at the East Riding Institute of Agriculture we consider it well worth while to instruct our students in some of the practice and theory of estate work.

The instruction given includes lectures on the design and erection of farm buildings, construction and maintenance of farm roads, types and construction of farm fences, land drainage, value and establishment of shelter-belts, management of woodland and several other 'fringe' aspects of farming. Lectures are supplemented with practical instruction, usually followed by students' participation in such operations as the laying of bricks and concrete blocks, concrete mixing and laying, joinery, window glazing, plumbing, management of estate woodland and shelter-belts, and conversion of estate timber.

The teaching is at two distinct levels. Young men on the general agricultural course (ages ranging from 18 to 23 years) are mainly instructed in the practical skills of estate work. In addition to organized demonstrations and practical classes, students spend half-days working with the estate staff carrying out routine estate work. The instruction is designed to enable them to carry out routine maintenance work and also provide them with the basic skills and confidence, so that many will be capable of doing fairly extensive building constructions by the time they leave. This will mean that not only will the farmer be less dependent upon the services of local builders, but that these men can be usefully employed during slack periods. As our students are essentially practically minded, theory instruction is kept to the minimum required to give them a broad appreciation of estate problems and to know how to go about tackling them.

Student doing brick-laying repair work to an existing pig house wall

Senior students

Our senior one-year course students (from 22 to 40 years of age) receive a more academic training in estate management. These students are primarily concerned with the study of farm management, and the teaching is directed so as to enable them to take positions of responsibility when they leave, e.g., as farmers, farm managers, working bailiffs, foremen, etc. Every effort, therefore, is made to dovetail the teaching of the two subjects and to emphasize the many complementary aspects of estate and farm management. We believe that a working knowledge of estate management will endow these potential farm managers with a more comprehensive insight of a farm as a business undertaking. This fuller appreciation is essential if a high degree of economic efficiency is to be achieved.

Most of the instruction to these students is through the medium of formal lectures. The lectures are largely given by external speakers, almost all of whom are specialists in their particular fields. Some of these speakers represent industries allied to the building trade, e.g., technical advisers of cement manufacturers, representatives from the Timber Research and Development Authority. We encourage these speakers to give a basic instruction in the correct use of the products they sponsor.

The bulk of the estate management lectures are, however, concerned with farm buildings, and these are given by officers of the Agricultural Land Service of the Ministry of Agriculture, Fisheries and Food. Our experience has shown that these officers are eminently suited as instructors, as not only do they have a wealth of knowledge and practical experience, but their everyday work is concerned with farmers and farm building problems. The study of farm buildings is essentially a practical subject, and our students appreciate the enlightened way in which the A.L.S. officers use their practical experience to put across the theoretical as well as practical aspects of farm buildings. Although a few lectures are given on such specialist topics as insulation, ventilation and detailed building construction, most of the lectures relate to the design and layout of buildings for specific classes of livestock and crops. This is the real 'meat' of the course. It is here that the associated problems of housing layout, design and construction and day-to-day management of an enterprise are brought together and the practical solutions formulated.

Visits to farms

Visits are also arranged by the A.L.S. officers to representative building installations in the area. A conscious effort is made to select buildings which illustrate the salient points of the lectures. During these visits the farmer happily, and often very ably, co-operates in explaining the planning and design difficulties encountered, and brings to the notice of students any mistakes which may have been made. Such matters as siting problems, and safety and hygiene aspects of the buildings, may also be discussed. Without the assistance of the A.L.S. and the farmers, the course would lose much of its value as a practical approach to teaching what is essentially a practical subject.

During the final term, the senior students are given farm building exercises. Here they are expected to use their initiative and the knowledge gained in the previous two terms to plan worthwhile improvements that could be effected to the fixed equipment at the Institute and other neighbouring farms. The students' proposals have to be presented on scale plans and be supported by full specifications and costings. The students are also expected to consider the farm management implications of their proposals. At this juncture opportunity is also taken of emphasizing the value of adequate plans and specifications before attempting any large-scale building project.

At our level of teaching, estate management is deemed to be nothing more than 'organized common sense'. This, unlike so many academic subjects, is something which, once acquired, is not easily forgotten.

This article has been contributed by **Haydn Davies, M.Sc.**, who is Lecturer in Crop Husbandry and Estate Management at the East Riding Institute of Agriculture, Bishop Burton, Beverley.

Cattle Poison in Bracken—

Study Aided by Trust

A recent grant of £3,895 from the Wellcome Trust will help Professor W. Charles Evans, head of the Department of Biochemistry and Soil Science in the School of Agriculture at the University College of North Wales, Bangor, to continue his studies on the nature of bracken poisoning among pastured animals. Earlier work of Professor Evans led to the discovery of an enzyme in bracken which destroys the vitamin thiamine in simple-stomached animals such as the pig and horse, with resulting peripheral nerve disorders. He is now attempting the isolation of another toxic principle from bracken which causes a haemorrhagic syndrome in ruminants.

The pallet box locked in place on the pram

Handling Feedingstuffs on the Farm

M. H. R. Soper

For some years we had become increasingly concerned at the amount of time that was being spent on the Oxford University Field Station in handling sacks of food. The problem came to a head with the decision to increase the sow breeding herd from 30 to 60 sows, and the erection of a fattening house to take their progeny through to bacon.

The problem

In the belief that it was still economically advantageous to mill and mix at home, not only for the pig unit but also for the 60–cow dairy herd and its followers, reared either for barley beef or as down-calving heifers, the problem was to find a system which would eliminate sack handling as far as possible, but yet enable the mixed food to be moved from the mixer to the different consumption points in bulk. The distance of these points from the central mixing plant (a conventional horizontal 1 ton mill/mix model), ruled out any system of pneumatic conveying, especially as the point of maximum consumption—the 350-pig fattening house—was also the most distant from the mixer (about 250 yards).

A loaded pallet box being wheeled on to the trailer backed into the loading pit

The alternatives

Having ruled out pneumatic conveying, our thoughts were directed to the possibility of using a method related to the handling of industrial products, particularly as the intake level of the fattening house was at trailer bed height—2 ft 6 in. and not at ground level. A system which would lift the food to this height and deposit it on the platform was clearly desirable.

The first possibility to be considered was the fork-lift truck, but this was discarded on the grounds of initial expense in relation to the amount of use it would get on the farm, and the problem of moving bulk containers once the lift had deposited them. The next consideration was some form of wheeled container or pallet box which would hold about 5 cwt of meal, and which could be raised or lowered on the front or rear lift of the tractor, and then pushed by hand to the pens in which the food was to be fed. At this point, our farm manager, Mr. Ian Morton, was fortunate enough to see at an agricultural show a proprietary 'food handling pram'.

This piece of equipment consists essentially of a pair of pneumatic wheels mounted on stub axles projecting from a rear axle fitted with a small pilot wheel. On this framework is mounted a superstructure consisting of two long horizontal bars. A lifting device is operated by means of a lever attached to two handles which are joined to the axle. Wooden pallet boxes holding 5 cwt of meal, measuring 2 ft 9 in. × 2 ft 9 in. × 2 ft 4 in. fitted with wooden flanges 12 in. from the base, are used as the carriers. The pram is pushed under the pallet box, so that the long horizontal bars pass under the flanges, and through the operation of the lever and the handles, the whole pallet box is lifted up and balanced over the wheels. In this position it is locked in place and is easily pushed by hand either through the handles, or by pressure on the box from the opposite end. Dampers ensure that the box is returned slowly to the ground by a further operation of the lever. This system avoids the necessity of having wheels on each box, for each one is moved with the same pair of wheels.

A demonstration on the farm by the makers proved sufficiently convincing to persuade us to develop the system for our own conditions. Problems of course still remained; particularly the moving of the 5 cwt pallet boxes full of meal to the fattening house, and then lifting them on to the intake

platform. The feeding of the dairy herd and the young stock presented no difficulty, for the cow yards, loose boxes and calf pens were all reasonably close to the mixer; the pallet boxes could be easily pushed by hand to wherever they were required and the food scooped out directly into the individual pens.

Adaptation

The farm staff very quickly solved the problem of moving the full boxes to the fattening house. After an initial attempt to auger the food to the boxes placed on a trailer had failed, an old trailer was lengthened by extending its bed by 3 feet with two steel joists, so that four boxes would fit on to it (4 boxes hold 1 ton of mix exactly). A shallow pit was then dug in the ground adjoining the concrete apron outside the food store, so that the extended trailer could be backed into it with the trailer bed at ground level.

The system now developed is that the empty box is pushed under the discharge chute of the mixer and is filled in 65 seconds. It is then wheeled by means of the pram on to the trailer and dumped there; the same procedure is adopted with the other three boxes; the whole procedure takes a total of 8 minutes. The trailer is driven round to the fattening house where the pram is again used to run the boxes into the food store, from where they are wheeled up the feeding passage and the pigs fed directly from them. The whole operation, up to the feeding of the pigs and including travelling time, takes 19 minutes.

Compared with the conventional feeding trolley, the square pallet box is more difficult to empty completely because of its corners, but this is a very minor disadvantage, and the virtually empty box is quite easily tipped up to get the last of the meal out.

The saving

Before the system was introduced, the pigman went through the following operations with a completed mix: (1) a sack was fitted to the mixer discharge chute and filled with meal; (2) it was released and pulled across the floor

Four 5-cwt pallet boxes loaded on to the trailer for transport to the fattening unit

to be stacked at the side of the store; (3) when the sacks had been filled, a trailer was backed in and (4) each sack was lifted by hand on to it and (5) pulled into place; (6) the trailer was driven round to the fattening house; (7) the sack was lifted off and (8) pulled into the food store and stacked; (9) the sack was lifted up again and tipped into a feed barrow; (10) the feed barrow was pushed up the passage for feeding.

On analysis, this was a time-wasting and energy-consuming system, which could not be allowed to continue. Compared with this, the 19 minutes taken with the pallet boxes represent a very great saving.

The pigman estimates that this saving may amount on average to about one hour per working day in feed handling (he also mixes and handles on occasion for the other units). With a 65-sow herd, looked after largely by one man, that one hour saved can be put to very good use in additional pig care. Quite apart from the time saved, there is the energy saved, and the better psychological effect of feeling that valuable time is not being wasted on an unnecessary chore.

The cost

The cost of a moving unit, or pram, was £62 (or £56 with narrow wheels), and the feeding of all the stock on the farm, with the exception of some barley beef steers in an outlying yard, is managed with two units (i.e., a total cost of £118). Twenty pallet boxes were purchased at a cost of £5 10*s*. each, but a good carpenter could probably make these on a well-equipped farm. Thus the complete cost to us was £228. The saving of one hour a day for a worker on a high rate of pay would very quickly cover this cost, but perhaps even more important still is the psychological effect. The time is rapidly passing when well-paid responsible men should be expected to do tedious and unnecessarily laborious jobs. On a medium-sized farm, where really large-scale bulk handling methods are not justified, the system described would seem to offer very definite advantages in the handling of food and in the saving of labour.

This article has been written by **M. H. R. Soper, O.B.E., M.A.,** who is a senior lecturer in the Department of Agriculture, University of Oxford, and is in charge of the farm.

Farm Safety Competition for Young Farmers

A new competition aimed at improving safety and efficiency on British farms is being organized in 1966 by the National Federation of Young Farmers' Clubs in conjunction with the Royal Society for the Prevention of Accidents. Shell and BP Farm Service is awarding the premier trophy, which will be competed for by teams of four young farmers. The teams will take part in eliminating contests at club, county and area levels in England and Wales, and the finals will be held at the 1966 Royal Show.

Dairy Bull Progeny Testing

Some aspects of the performance of 600 heifers at two test stations

Lucia Pearson

BETWEEN 1953 and 1964, considerable material accumulated from the dairy bull progeny tests run at two centres by The British Oil and Cake Mills Ltd. (BOCM). The data consisted of the records of 319 daughters of 24 Ayrshire bulls tested at South Cathkin, near Glasgow, and of 283 Friesian heifers, the progeny of 21 sires, which were on test at Selby in Yorkshire. Sixty-one of the Friesian heifers were brought to Selby as calves and reared under uniform conditions before they entered the tests. Otherwise, the heifers arrived at the stations about six weeks before they were due to calve. They were 'steamed up' in preparation for calving, then fed a basic maintenance ration and according to individual production of milk and fat. The test continued until each progeny group had been milked for an average of 270 days. The recorded data were used for two investigations. First, it seemed of practical interest to examine the performance of the heifers under test conditions since they represented the two most important British dairy breeds and their station records were uniquely detailed. Second, an attempt was made to assess the utility of the station method of progeny testing dairy bulls.

Performance of the heifers under test conditions

The effects of early environment

The level of milk yield in the test heifers' herds of origin was used as a guide to their past environment. Judged in this way, previous management appeared to have very little effect on the production of milk or milk solids at the station, except that milk yield was depressed when the standard of rearing was very low indeed. The results justified the recommendation that heifers should be reared on a moderate plane if they are then to be 'steamed up' and fed according to a scale such as that used by BOCM. The results also supported the view that variation in milk yield between commercial herds is almost entirely caused by differences in management immediately before and during lactation.

Age, body weight and weight for age measured straight after calving were not clearly related to the heifers' milking performance. The Friesians, in particular, varied so widely in skeletal size that their body weights reflected very different combinations of body size and body condition. In general, it seemed unlikely that statistics involving age or body weight could be of much practical use to the farmer, without further qualifications, because neither measurement described the animals' physiological development consistently.

Milking characteristics

The length of time taken to milk the heifers depended largely on the rate of milking. For the Ayrshires and Friesians respectively, differences in time were due 34 per cent and 41 per cent to differences in rate and only 9 per cent and 16 per cent to differences in yield. Although there was a general tendency for high milk yields to be associated with rapid rates of milking, there was considerable variation in each trait independent of the other and there was no evidence that fast milking rates increased the persistency of production. Strippings yield was not closely related to any other measured trait, but high yield of strippings seemed to be associated either with high yields of milk or with exceptionally slow rates of milking. Genetic control of this trait was apparently near zero.

Milk production

On the whole, the daughters of bulls at the test stations produced yields of milk similar to those produced by daughters in commercial herds. In both breeds, the heifers which gave highest yields early in the lactation tended to increase their superiority as the test proceeded. The results indicated that the culling of heifers and the selection of sires on the basis of 0–90 day totals or even highest daily yields would generally be justified, although the value of certain Ayrshire bulls would have been over-estimated by this procedure.

Milk solids production

The test heifers' butterfat percentage slightly exceeded that of their half-sisters in the field. In contrast to usual findings, the milk yield of the progeny groups at both stations was positively correlated with the percentage butterfat and independent of the percentage solids-not-fat (s.n.f.). This abnormal result may have reflected the care with which the heifers were fed according to milk yield and composition, using foods which were frequently analysed for their nutrient content.

The percentage butterfat measured over 0–90 days gave a good indication of performance over the whole test but the levels of s.n.f. varied considerably during the lactation and were particularly affected by the date of conception. Both within and between progeny groups, the correlations between butterfat and s.n.f. percentages were low over 0–90 days and only about +0·5 over 0–270 days. This suggested that selection of individual heifers or sires for high total milk solids content could not have been made very accurately at either stage of the lactation on the basis of butterfat percentage alone.

Fertility

The fertility of the test heifers was abnormally low by field standards, but similarly low levels had been reported from other test stations and from

newly-established commercial herds. In the case of the BOCM heifers, no physical cause could be traced in spite of thorough investigation. It seemed possible to show that their reproductive efficiency may simply have been upset by nervous disturbances following the changes of surroundings and 'herd order'. In that case, a temporary reduction in fertility which has no pathological basis might generally be expected when dairy cattle are brought together for the first time.

Station progeny test for proving dairy bulls

The BOCM station tests relied on the first lactation performance of an average of 13 daughters in each progeny group. The experiment demonstrated that the station system can provide assessments on sires which correspond closely with results obtained by the 'contemporary comparison' field method. This conclusion applied to milk yield and butterfat percentage, and contrasted with the disappointing results of the early station tests carried out in Denmark.

The BOCM test daughters' 0–90 day average production was usually a reliable guide to their sires' 0–270 day station assessments and 0–305 day field rankings for milk and fat, except when the station group had been very poorly reared. Therefore, a shortened station test should be equally as accurate as one based on 270 days, provided that pre-test environmental influences are eliminated successfully. If this involved a long period spent at the station before calving, the shorter test might not be less costly. Variation in the production of milk and milk solids was reduced when the progeny groups were reared at the Selby centre from calfhood, but the procedure was too expensive to be recommended for general use. Nevertheless, if this difficulty could be overcome, a shortened test would increase the possible rate of genetic improvement and might produce more accurate results because factors which influenced the heifers' performance during the lactation, such as disease and pregnancy, would have less opportunity to develop.

It seems unlikely that the station system will come into widespread use in Britain. Compared with a field method, its main disadvantages are the high cost and slow speed of genetic gain. On the other hand, the method would be valuable where field records were scarce. It might also be used to obtain supplementary information on bulls with promising preliminary proofs from the field if milking rate, conformation or other traits which cannot be measured easily on farms should become sufficiently important to the dairy industry.

Acknowledgment

The author is most grateful to the British Oil and Cake Mills Ltd., who provided the material and the financial support for this work, and to the numerous people who generously gave her advice and additional information.

The author of this article is **Dr. Lucia Pearson** who, as a BOCM Research Fellow, recently spent three years at the University of Leeds and in 1964 prepared a thesis which was based on BOCM's ten years of progeny testing of Friesians and Ayrshires. She is at present in America, working with the U.S. Department of Agriculture.

New diseases are kept out of the country by quarantine measures but long-established diseases continue

Peas and Tic Beans

- attacked by Ascochyta

P. D. Hewett

BROWN leaf-spots are the first signs of *Ascochyta* infection. Easily overlooked on young plants, these spots act as sources of fresh, infectious spores. Given suitable wet weather, these microscopic spores soon spread the disease through the crop and lower yields result, particularly if stems are attacked. Leaf-spot due to *A. pisi* has been known on peas in Britain since 1841; leaf-spot of beans, caused by the very similar fungus *A. fabae*, was reported over sixty years ago. Severe attacks on both crops occurred last year and were traced to the sowing of infected seed.

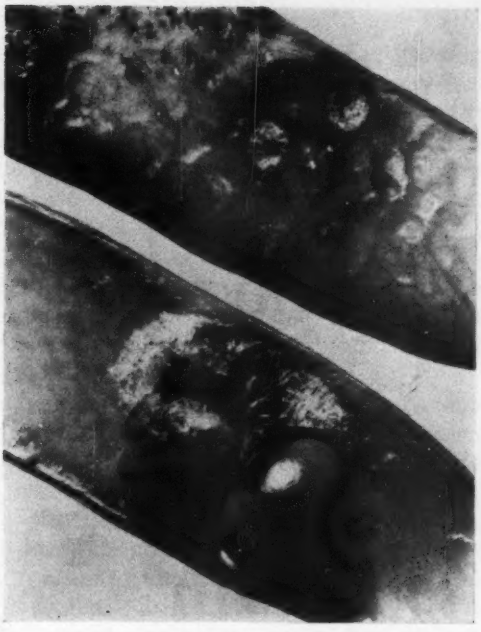
Weather conditions determine the severity of attack. When suitable conditions persist, lesions develop freely on pods and infection reaches the seeds, causing discoloration and death. Due to relatively early harvesting, vining peas tend to escape seed infection but it only needs a few spotted peas to lead to rejection for processing. Severe seed infection can develop in the later-harvested seed crops. If badly-infected seed lots are sown, poor field establishment may result, particularly in the case of early sowings.

Outbreaks are difficult to check

Effective spraying would probably prevent the spread of leaf-spot, but we do not know if it is economically practicable for either crop. Control by the use of resistant varieties of peas is a possibility but is complicated by the existence of different races of the fungus.

In this country infected seeds start most outbreaks of *Ascochyta* leaf-spot since the usual crop rotations greatly reduce the likelihood of old haulm acting as a reservoir of infectious spores. Seed infection has little effect on the laboratory germination percentage and severely-infected samples of peas and tic beans can give satisfactory figures. Some years ago special tests were used to examine samples of seed peas sent to Cambridge and widespread infection was revealed. In some commonly sown varieties most of the samples examined were found to be infected. Unfortunately the chemical

Seed infection by Ascochyta



seed treatments which are commercially available are not satisfactory for controlling *Ascochyta*, although giving protection against soil-borne fungi.

Starting with tested seed

The experience of pea growers in Austria is interesting. During the past five years there have been few outbreaks of the disease and the fixing of health standards for seeds has helped to bring this about. Top-grade peas sown for vining must not have more than 1 per cent seeds infected with *Ascochyta*; second-quality seed may have up to 5 per cent infection. These new, improved standards are fixed by legislation. Similar standards have been recommended in Canada since 1958. Pea growers there can sow 'registered' seed which has been tested for *Ascochyta* and found to contain not more than 6 per cent infection.

How much of the seed sown in this country reaches these standards? From the survey mentioned earlier it can be estimated that in bad years up to half the samples may be below standard, and that on average around a quarter would not reach the Austrian requirements. One grower of vining peas recently submitted nine offered seed samples for *Ascochyta* tests—only four were sufficiently healthy to reach top quality, and two would have been classified 'unfit for sowing', despite high laboratory germination. Considerable *Ascochyta* infection has also been found in certain stocks of tic beans, for which a similar test is available.

Samples of seed can be sent to the Official Seed Testing Station, Huntingdon Road, Cambridge, for examination for *Ascochyta* infection. The fee for each test is 30*s*.

This article has been contributed by **P. D. Hewett, B.Sc., A.R.C.S.**, seed mycologist at the Official Seed Testing Station, Cambridge.

Graham Milbourn

Maize for Grain

— A Break Crop in Cereal Growing?

FIELD-SCALE trials on the production of maize for grain have been started at Wye College. Two reasons have prompted this introduction. First, the breeding of early-maturing hybrids on the Continent and in England has developed varieties which give promising yields in our conditions. The south and east of England can now be considered as inside the northern limits for the cultivation of this crop. Secondly, maize for grain offers a distinct possibility as a break crop in cereal growing. Apart from complete freedom from take-all and eyespot, which can limit successive wheat or barley cropping, it also gives the opportunity for considerable control of grass weeds which are already a dominant problem in some areas. Furthermore, maize avoids the main sowing and harvesting labour peaks of our own cereals and uses much of the same equipment. Although it is unlikely that maize will compete in profitability with wheat or barley, from many aspects it could be a more attractive break crop than some of the alternatives, such as grass used for beef or sheep production.

European experience

In the last ten years there has been a rapid spread of maize growing north of the 49th parallel. In Canada, early hybrids will ripen in a frost-free season of 110 days, but temperatures during this short period are high. At the same latitude in Europe (Paris = 49 deg N.) the growing season is longer (140–150 days), but much cooler during the spring. Early hybrids developed in a number of European countries to tolerate these cool conditions now give far more reliable yields than the earlier introductions from the United States. Up to 50 miles north of Paris, maize yields often exceed wheat, and with the high prices offered for maize within the Common Market, this crop is an attractive proposition. For example, on a 500-acre farm visited last year in this area near Beauvais, the rotation consisted of 1 year wheat or barley, 1 year maize.

The crop is harvested by combine, which is fitted with a cob-picking attachment (illustrated p. 34). This operation starts in October and continues through to Christmas if necessary. Obviously by this late stage ground conditions can make harvesting difficult and frost on the foliage will also halt operations. The cob is well protected from rain and will gradually dry out through the autumn to a moisture content of 35–45 per cent. The shelled grain off the combine still presents quite a problem in drying, and the French farmers construct simple batch-driers which can bring a 2 ft depth of maize to 15 per cent moisture in about eight hours. The grain is then delivered direct to animal feed compounders.

The crop is gradually extending northwards in France and trials have been conducted this year to introduce it to Brittany. It is a short step to cross the Channel. This means that the southern counties in England are about 100 miles further north than the area in France where maize out-yields wheat. Inevitably some loss in yield must result in our less favourable climate. It is unlikely that rainfall during the growing period would limit growth, but in our wet summers temperatures are lower than the ideal and yields could vary more from year to year than do yields of our other cereals.

Yield levels

N.I.A.B. trials on grain maize varieties provide the only information on which to base likely yield levels. The following yields have been obtained in Kent N.A.A.S. trials which were carried out in conjunction with the N.I.A.B. and the A.R.C. Unit of Experimental Agronomy, Oxford.

	Yield of maize grain (cwt per acre at 15 per cent moisture)				
Variety	*1961*	*1962*	*1963*	*1964*	*Variety mean*
Kelvedon 59 (Britain)	67·2	49·3	42·3	70·9	57·4
Inra 200 (France)	77·5	41·1	46·8	74·5	59·9
Annual mean	72·3	45·2	44·5	72·7	

This data was obtained from small plots which were hand harvested. The yields of these hybrids was about 2 tons of grain per acre in the years less favourable for the crop (1962 and 1963), and the yields were considerably better than this in the warmer years. On the basis of these results it would seem reasonable to expect the well-managed field crop to average 2 tons of grain to the acre. It will be necessary, however, for the field-scale trials at Wye to continue over several seasons to obtain a realistic estimate of yield

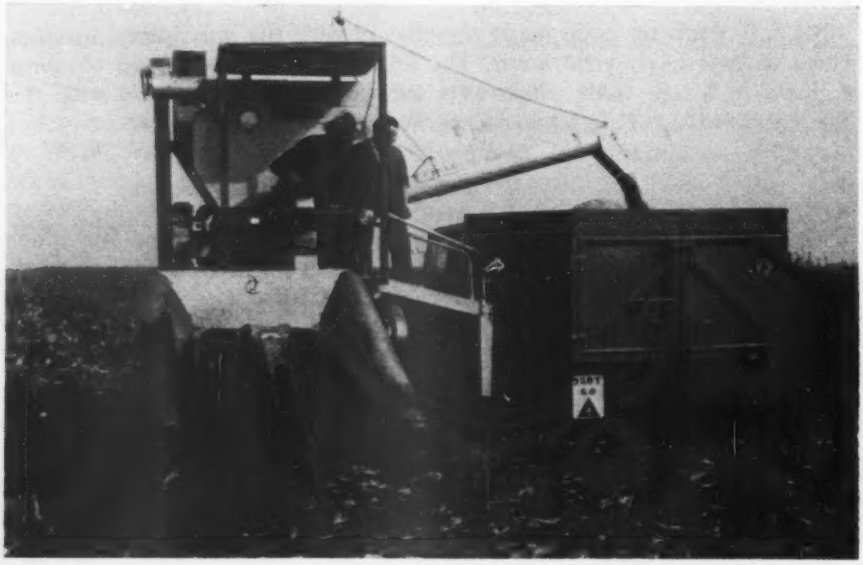
using normal harvesting machinery. A cheap method of grain storage must also be devised. In view of the demand by arable farmers for new break crops that have a low labour requirement it is worth outlining experience so far in applying some of the French cultivation techniques. It is also worth assessing the problem of including maize as part of a cropping programme.

High levels of phosphate and potash are needed (80–100 units of each) and the problem of placement of these nutrients in the soil can be overcome by ploughing-in the dressing during the autumn after grass weeds have received some attention. It is preferable to leave the weathered furrow untouched and so conserve moisture until sowing. In the event of weed growth, however, there is a further opportunity for control by cultivations before the soil is warm enough for sowing (50°F; 10°C), which is usually at the end of April or early May. During seedbed preparation, it is the practice in France to work in about 100 units of nitrogen together with the herbicide atrazine in granular form, taking care that the implements cover the ground evenly and without losing moisture, in the way we prepare for sugar beet. Undoubtedly one of the secrets of success is to obtain a high plant population. French trials show that the short standing, early hybrids need a minimum of 35,000 plants per acre at harvest. At this density each plant rarely carries more than one cob. Allowing for losses, particularly during germination, about 44,000 seeds per acre should be sown.

Pest problems

Although maize is unaffected by disease in our climate, there are some pests which can be a problem. Rooks can be a menace if they are not discouraged with bangers and hanging up dead rooks during the critical period of crop emergence. Stringing some areas with black terylene thread at waist height is also very effective, and need only take about $\frac{1}{3}$ man-hour per acre if strung in squares of 50 square yards. Other pests that need keeping an eye on are frit-fly, which may need spraying with D.D.T. in a cold spring,

A combine harvester in northern France fitted with a cob-picking attachment for maize



Harvesting maize for grain at Wye College

and wireworm, for which seed dressing is always advisable even though their presence is unlikely after a sequence of cereals.

The growing season in 1965 was not a good one for maize. But although the hours of sunshine were 20 per cent below average between June-August, the crop at Wye grew satisfactorily after adopting the cultural techniques employed in northern France (see illustration above). The yield of the hybrids Kelvedon 59 and Inra 200 averaged 35 cwt per acre dry grain with the expenditure of 12 man-hours per acre up to and including harvest. The control of grass weeds, both annual and perennial, was most promising. This is attributed to the opportunity for cleaning in the autumn and spring, the higher solubility of atrazine (compared with simazine) for conditions of drying soil, and the effective smother by a dense stand of maize.

For grain that comes off the combine at 40–50 per cent moisture, drying is both expensive and inconvenient. A very promising alternative which is being tried this year is a wet grain storage system using butyl rubber sheeting. Cylinders of this sheeting can be supported by weldmesh for a total capital cost of £3 10*s*. per ton.

Gross margin

Based on the experience of these trials, it is possible to make an estimate of the gross margin per acre as follows:

Variable costs	£	*Output*	£
Seed:		35 cwt @ £21 per ton	36·7
35 lb @ £11 5*s*. per cwt	3·6	(Assumed as equivalent to barley purchase price, and taking yield obtained in Wye trials in the below-average season 1965)	
Fertilizers:			
5 cwt 0 : 20 : 20 @ £19 8*s*. per ton 5 cwt sulphate of ammonia @ £13 3*s*. per ton	8·3		
Spray:			
2 lb atrazine compound @ £1 16*s*. per lb	3·6		
Extra harvesting and storing costs	3·0		
Total Variable Costs	18·5		
Gross Margin per acre	18·2		

The gross margin compares very favourably with that from traditional sheep or beef production from a grass break. For the most part maize can make use of existing equipment for cereal production, and it has the additional merit of doing so at off-peak times. One extra piece of specialized equipment that is required, however, is the maize cutting attachment for the combine; its cost, at £650, amounts to about £2 10*s*. per acre per annum for depreciation and repairs when used on 30 acres a year. Annual depreciation on cheap wet grain storage equipment could be no more than 10*s*. per ton. Both these items are included in the variable costs.

Maize attracts no subsidy payment. If there is a place for this crop in British farming a subsidy would greatly enhance its prospects and could lead to a saving in dollar imports. The gross margin would then be comparable to a good winter bean crop which has many similarities as a break crop. Both maize and beans have been notable for their variability in yield. However, many of the outstanding problems associated with growing maize in our climate, such as early maturity, weed control, harvesting and storage, now seem capable of solution and it should take only a few years of development work to establish the yield level and the suitability of the crop as a preparation for further wheat or barley growing.

Dr. G. M. Milbourn is Lecturer in Crop Production at Wye College (University of London), Kent. He took his degree at Reading University and was for a time Assistant Lecturer there. Before taking up his present appointment he was at the A.R.C. Radiobiological Laboratory.

New Look to Spring Demonstration

New innovation at the 11th annual *Farmer's Weekly* Spring Demonstration, which is to be held on Thursday, 3rd March, 1966, will be working demonstrations of leading solid manure spreaders. The 80–acre site at the Fields, Lowfield Heath, Surrey, is adjacent to the south side of Gatwick Airport, and has been provided by courtesy of Messrs. C. F. Keen and Sons (Charlwood) Ltd. The Demonstration will include the National Hedge Laying and Ditching Contest as well as practical demonstrations of hedge cutters and trimmers. Similarly, mechanical ditch cleaners/diggers will show how they tackle the job. Twenty acres of the site will demonstrate field drainage with plastic piping and other materials. In addition, land-drainage and tile-laying machinery will be shown in action.

W. A. THOMPSON

Agricultural Land Service,
Wolverhampton

Calf Housing

— A West-Midland Survey

CALF mortality in the United Kingdom is generally accepted to be 10–12 per cent of all calves reared to 12 weeks, and there is no doubt that poor housing conditions are responsible for some of these losses. The rapid growth of intensive rearing of large numbers of 'bought-in' calves has brought special problems, and it was to try to identify these problems in relation to housing that a survey of existing calf-rearing units was undertaken in the West Midland region of the Ministry a year ago.

Thirty farms were visited by the A.L.S. in conjunction with the Livestock Husbandry Officers of the N.A.A.S., and thirty-eight buildings were examined. Data was collected on siting and degree of exposure, construction and degree and method of heating, ventilation and insulation, feeding, lighting, sterilization break and labour requirement. From this information calculations were made of the level of artificial heat input, heat loss through the building structure, stocking rate and cubic capacity. An assessment was also made of the level of management and stockmanship.

The standard of performance of the various buildings was judged by the record of mortality. Mortality ranged from nil to 16 per cent, but for the purposes of comparison a demarcation between high and low mortality had to be drawn. This was fixed at 2 per cent or below to form the low mortality group, comprising 15 out of 38 buildings, and 6 per cent and above the high mortality group, comprising 14 out of 38. The nine 'in-between' cases from 2–6 per cent mortality were discounted.

The information obtained showed a connection between the level of mortality and four factors.

Stockmanship

Firstly, as one would expect, there is a direct link between low mortality and a high standard of management and stockmanship. In the 15 cases with low mortality, management was above average in all but one. The overall

standard of management in the 14 high-mortality cases was lower, being above average in 7, average in 6 and below average in one case where mortality was 16 per cent.

It is comparatively simple to maintain a suitable environment in a properly-designed, fully-controlled-environment building. The controls are automatic once the thermostats are set. All that management has to do is select the temperature and maintain the equipment. However, in most of the buildings surveyed there were no such facilities, and in these circumstances the quality of the environment depends very much upon the skill of the management and upon an appreciation of environmental requirements. This leads to the second factor which emerged—the need for adequate ventilation.

Ventilation

Of the 15 cases in the low mortality group, ventilation was assessed as good in 9, reasonable in 5, and poor in 1 case. Of the 14 high-mortality cases, ventilation was reasonable in 2 cases only, poor in 10, and bad in 2 cases. It appears that the need at all times for good ventilation without draught is not generally appreciated. In some cases even when the need is recognized, the limitations imposed by the building do not permit a sufficiently high rate of ventilation without causing too great a reduction in temperature or without causing draughts. As temperature is easily measured and more readily appreciated by human senses than the relative freshness or relative humidity of the air, it is accepted by most as the scale against which environment is assessed. But this method of evaluating environment remains valid only if the insulation value of the building and/or the level of artificial heat input permits the lowest acceptable temperature to be maintained without reducing ventilation below the minimum. Of the 38 buildings examined, only five could be said to fulfil these requirements. Four out of the five had thermostatic control of both heating and ventilation, and could be said to provide fully-controlled environment. Mortality was low in these cases. The fifth was the most highly insulated of all, but control of the fans was manual, and therefore depended on human appreciation of conditions. Mortality in this case was 6·5 per cent.

Of the remaining 11 buildings in the low mortality group, all but one had good or reasonable ventilation. What is more important, however, is that most of these buildings had a number of permanently open ventilators which maintained a minimum of air change in the worst of conditions and irrespective of temperature. This latter factor mitigates against the natural tendency of most people to cease ventilating altogether when the temperature falls below what is considered to be the acceptable minimum. It is worth noting here that several farmers were raising calves with low mortality rates at temperatures only just above the ambient after the second week, but none were doing it successfully in badly-ventilated conditions. This is not to say that temperature is unimportant, but clearly it is less important after the second or third week. What it is important to realize is that it is wrong to try to control temperature below a certain level in uninsulated buildings if, in order to do this, it is necessary to close all ventilators. Ventilation must be maintained at all times, and if the temperature falls below the minimum acceptable then insulation should be provided against heat loss or supplementary artificial heat provided. If the building is high and lofty,

it may be expensive to insulate and there is a case for using straw-bale kennels to conserve body heat. The efficiency of straw-bale kennels can be increased by using reflective insulation such as aluminium-foil-backed paper under the straw-bale roof. The object with kennels is to create a warm cell within the building and not to heat the whole of the building. Therefore any artificial heat provided should be of the radiant type, and lamps should be suspended so that they shine into the kennel, not vertically downward where most of the heat is lost.

Cubic capacity

The third factor relates to the cubic capacity of the building. It was found that in all but three of the fifteen cases in the low mortality group the cubic capacity per calf was high at 260 cu. ft or above. Two of the three cases below 260 cu. ft/calf were controlled-environment houses with thermostatically-controlled mechanical ventilators. In the high mortality group, the proportion of buildings below 260 cu. ft/calf was much greater, and whilst some had mechanical ventilation, it was manually not thermostatically controlled. The significance of high cubic capacity in relation to ventilation is twofold:

(a) In the main, high cubic capacity is associated with buildings of traditional construction; converted single-rank shippons with high eaves level and old brick-and-tile barns are typical examples. The combination of height and space enables air to be introduced well above the level of the calves with a minimum risk of draughts.

(b) When weather conditions change rapidly, as often happens in the autumn, and when all ventilators are closed to maintain the temperature, then there is a reserve of air in the building. The reserve serves as a buffer against inadequate ventilation and may be sufficient to prevent conditions deteriorating to the stage where the health of the calves is endangered.

It is also likely in traditionally-constructed buildings with roofs composed of old cambered tiles that a small degree of air change is continuously taking place due to the gaps in the tiling. The roof is commonly referred to as being able to breathe, and this is borne out by the fact that condensation rarely occurs on this type of roof.

Sterilization break

Finally, the importance of an 'all-in, all-out' policy, and a sterilization break period, was evidenced by the fact that in 50 per cent of the high-mortality cases, no sterilization break was allowed beyond the time taken to clean out and disinfect, and throughput was not less than eight batches a year. In the low mortality group, the minimum sterilization break was 14 days and the annual throughput no more than six batches.

Briefly summarizing the conclusions, it would be fair to say that as far as management is concerned intensive rearing is a specialized job, demanding not only a high standard of stockmanship but an intelligent appreciation of the environmental requirements of the calf in all stages of growth.

The methods employed to obtain an acceptable environment will vary according to the type of building used. If the building is a purpose-built

calf house or a converted piggery or poultry house, then it is likely that the cubic capacity will be low and the stocking rate high. The aim in this case should be a fully-controlled-environment building, well insulated and equipped with heaters and mechanical ventilators, all thermostatically controlled. If the building is a conversion from a shippon or barn, or similar building of traditional construction with a high cubic content and low stocking rate, then permanent ventilation is necessary. The aim should be to create the right environment in the immediate vicinity of the calf, rather than the house as a whole, by forming a straw-bale kennel and providing supplementary radiant heating. A good maxim is never sacrifice ventilation to maintain temperature; provide heat, or insulate, or both. Lastly, don't push your luck, give the building a rest of at least fourteen days between batches.

The Ministry's Publications

Since the list published in the December, 1965, issue of *Agriculture* (p. 613) the following publications have been issued.

MAJOR PUBLICATIONS

Bulletin No. 159. Refrigerated Stores for Fruit (Revised) 3*s*. (by post 3*s*. 5*d*.)

Bulletin No. 168. Table Chickens (Revised) 5*s*. 6*d*. (by post 6*s*.)

Bulletin No. 186. Cereal Pests (New) 12*s*. (by post 12*s*. 7*d*.)

Animal Disease Surveys Report No. 2, Part II: Fluorosis in Cattle (New) 11*s*. (by post 11*s*. 7*d*.)

Farm as a Business. Aids to Management–7. Arable Crops and Grass (New) 2*s*. 6*d*. (by post 2*s*. 11*d*.)

ADVISORY LEAFLETS

(*Price 4d. each—by post 7d.*)

No. 46. Docks and Sorrels (Revised)

No. 51. Thistles and their Control (Revised)

No. 88. Mussel Scale and Brown Scale (Revised)

No. 163. Onion Fly (Revised)

No. 269. Cabbage Aphid (Revised)

No. 304. Cereal Take-all (Revised)

No. 334. Pea Moth (Revised)

No. 375. Cloche Cultivation (Revised)

No. 396. Rearing Chickens for Egg Production (Revised)

No. 539. Efficient Milking (New)

No. 542. Lime in Agriculture (New)

MECHANIZATION LEAFLETS

No. 5. Glasshouse Ventilation (New) 1*s*. (by post 1*s*. 3*d*.)

The publications listed above are obtainable from Government Bookshops (addresses on p. 50), or through any bookseller.

36. Mansfield, Nottinghamshire

D. E. Bawcutt

One of the features of the Mansfield District is the contrasting landscape which embraces agriculture, forestry and coal mining. Mansfield is the heart of industrial Nottinghamshire. To the south-west is the river Erewash forming the boundary between Nottinghamshire and Derbyshire; further north high land which rises to over 600 feet forms the boundary. The coalfield lies through these hills all the way from Worksop in the north to Nottingham in the south. The ravages of opencast coal mining are to be seen in the coal measures country, and in many parts farm buildings and field drainage have been disrupted by deep mining subsidence. In the coal measures area small farms predominate, and farming systems are very mixed. Where drainage is satisfactory crop yields of both cereals and roots can be very good. Land restored after opencast coal operations varies in its productive ability; much depends on how well the site was restored but probably more important has been the individual management, particularly the use of nitrogen on grassland. Where sufficient nitrogen has been used, excellent grassland production has been achieved.

Adjacent and to the east of the coal measures is a narrow belt of magnesian limestone. This is probably the best cash cropping land in the district, particularly where there is adequate depth of soil. High quality potatoes are produced and these find a ready market in the Midlands and Yorkshire. This land has a high potential for the production of potatoes, but unfortunately loose stone is hampering the full mechanization of harvesting the crop. The limestone gives way to some useful arable land on the fringe of the bunter sand, and again this area is largely devoted to cash cropping.

Sherwood Forest, a most remarkable natural area, is an impressive surviving remnant of the vast forest which once clothed the low-lying parts of England. Forestry, both private and under the auspices of the Forestry Commission, utilizes a considerable acreage and several large forests lie within the bounds of the district. The development of farming on the sand in recent years has been outstanding, and the gulf between land values and rents on this land and those of other better soil types has been much reduced during the past ten years. The rivers Ryton, Poulter, Meden and Maun, provide water for surface irrigation which is mainly used by farms with cash cropping systems; early potatoes and sugar beet give a good response to irrigation. There are, however, a few large dairy herds situated by these rivers. In bygone days water from these rivers had been conveyed by carrier dykes to elaborate flood meadows, but this was restricted to a very limited

acreage of permanent grass. Lime and nitrogen together with a decline in the rabbit population have substantially improved crop yields, although much crop potential is still lost through the inherent acidity of the bunter sand. At the other extreme, mineral deficiency problems arise where too much lime has been applied.

For farmers on this soil type the threat of a dry season is always in the background and the farm economy is markedly affected by a dry summer. Yields at their best are considerably below the normal output from better-bodied land. During the past two years there has been an appreciable revival of interest in the potato crop with the introduction of the scab-resistant variety Pentland Crown. For some years scab problems deterred most farmers from attempting potato production on this land with the exception of those in a position to irrigate; where possible this practice has given a very marked degree of control over scab. Sugar beet has largely replaced fodder roots which were formerly grown for sheep keep. The trend has been towards more simplified farming, with barley the chief crop. Many farmers have felt that, provided soil organic matter levels can be maintained under intensive cereal production, there is virtually no fear of loss of soil structure on sand land. Pest and disease problems have not arisen, and indeed some farmers can point to an upward trend with barley yields. Wind erosion during the early part of the spring in some years is still responsible for the loss of a considerable sugar beet acreage, and it may also damage the freshly emerging cereal crops. In particularly exposed areas some farmers have resorted to strip farming with advantage, and some occupiers are giving thought to the provision of shelter-belts. The trend towards larger fields with the widespread removal of hedges has reinforced the need for planning such windbreaks.

Lucerne, at one time thought to be the answer to droughted grassland, has declined in acreage and most of the crop which remains is on farms which possess specialized drying equipment. Poor grassland utilization is undoubtedly more acute on this soil type, and an unsatisfactory level of profit is commonly associated with the grazing livestock enterprise which does not pull its weight in the overall farm business. Low stocking rates and an absence of a livestock system are the major deficiencies. Pigs and poultry play an important part on sand land farms; the specialized barley growers have in many instances turned to pigs as sources of additional profit as there is a good supply of weaners coming from the smaller breeding units in and around Mansfield. Adjacent to the main Nottingham to Ollerton road there is a series of poultry units which are part of a huge network of broiler production extending from Nottinghamshire to the southern counties.

The eastern portion of the district is on keuper marl. Here there are large intensive cereal growers alongside large dairy units. Yields of grass, cereals, particularly wheat, and roots are of a high order. An unexpected feature on the keuper marl are the oil wells at Eakring. Large quantities of oil have been produced from these wells but they are to close down in the near future as the quest for oil spreads eastwards. The Minster town of Southwell lies in the south-east corner of the district. At one time at Southwell and in the adjacent parishes fruit featured as an important facet of agricultural production, and even today fruit trees appear in many of the hedgerows together with orchards both old and new. The famous Bramley's Seedling was first planted at Easthorpe, Southwell, in 1805.

IN BRIEF

De-watering Poultry Manure

Following up a suggestion arising from contact with the Esso Petroleum Co. Ltd., the N.A.A.S. in the South-Eastern Region has been looking at a new method of de-watering poultry manure. In this process neat battery manure is heated with an industrial organic solvent. In theory the method releases the 'tied' water in the wet manure and this water is in part replaced by the solvent. The advantages claimed are that heat transfer is more efficient in a fluid compared with direct heating of poultry manure, and that most of the obnoxious smell associated with heating poultry manure will be absorbed. The loss of nitrogen during the process is alleged to be very small.

Solvent and water are boiled off together and are condensed. Water sinks to the bottom of the collection vessel and the lighter solvent returns for re-cycling. When distillation of water is completed, excess solvent is decanted off from the manure which is now moisture-free. It is clear that water held in poultry manure can be released in this way but a small residue of solvent remains with the manure; this however evaporates on exposure to atmosphere.

When refluxing begins there is a typical poultry-manure smell for a short time. The water condensed is relatively pure and sterile, and is suitable for release into any watercourse or normal channel. The residual manure is friable and of a normal N.P.K. content.

The solvent is highly inflammable and in any process of this type, suitable safety precautions should be taken. From an examination of the process so far in the laboratory, it would appear that it is uneconomical due to the high cost of solvent and to the heat required for refluxing the solvent. There are, however, possibilities for development and/or use in special circumstances.

C. T. Riley

800 Colours in New Horticultural Chart

Eight hundred colours will be included in a comprehensive horticultural colour chart which is being prepared by the Royal Horticultural Society. The chart is being produced by McCorquodale Colour Display Ltd., who will supply 10,000 sets of four fans to each chart, by a special colour depositing process. It is intended to publish the chart in time for the International Horticultural Congress which will be held in the United States of America during August, 1966. The last colour chart published by the Society was produced in 1938 by conventional printing methods, under which colours can vary slightly on different copies. It is claimed that, using the special process, there is no variation in colours between the first and 10,000th sets. The purpose is to provide a ready means of reference for all the colours of flowers and vegetables; hence it is highly desirable to maintain constant colours throughout all copies of the chart.

Report of the Agricultural Research Council, 1963-65

The report of the Agricultural Research Council, covering the two years April, 1963, to March, 1965, was published in October. It includes notes on developments of general interest, and brief descriptions of research in progress at nine of the institutes supported by the Council. The Report shows that the level of the Council's support for research projects at universities has more than doubled over the last five years, and details are given of the latest major projects to be supported by the Council's grants.

The Report mentions that problems of 'minimal cultivation' are being studied by the Weed Research Organisation in collaboration with the National Institute of Agricultural Engineering. Mention is also made of work done by the National Vegetable Research Station at Wellesbourne on studying the populations of viable weed seeds in different soils. Up to 348 million viable seeds per acre have been recorded in the top six inches of soil. Despite the great variation in this country's soil types, the populations are composed very largely of the same seven species, although the proportions differ according to whether cereals or vegetables are being grown. The National Vegetable Research Station is also working on the problems arising out of the use of organochlorine insecticides.

Another point of interest is that the Scottish Station of the National Institute of Agricultural Engineering has developed and field-tested electronic equipment capable of separating potatoes from clods and stones. Negotiations are proceeding between the National Research Development Corporation and manufacturers for its commercial exploitation.

The Council's gross expenditure on agricultural research rose from £7·6 million in 1963–64 to £8·5 million in 1964–65. In addition, the Department of Agriculture and Fisheries for Scotland spent £1·6 million in 1964–65 on grants, made on the advice of the Council, to State-aided institutes in Scotland, compared with £1·4 million in 1963–64.

The Report (Cmnd. 2792) is obtainable from H.M.S.O., price 8*s*. (by post 8*s*. 7*d*.).

Working Capital Grants to Co-operative Bodies

The Ministry recently announced that the working capital grants already available to horticulture under section 4 of the Agriculture and Horticulture Act 1964 are being extended to agriculture. The purpose of these grants is to assist farmers and growers who co-operate in storing, preparing for market and marketing their produce. The grants are available to newly-formed co-operatives and registered groups of a co-operative nature towards the capital they require for certain purposes in the early stages of their development. They are also available to existing co-operatives and groups towards the working capital required when they aim to expand or increase the efficiency of their businesses.

Grants will not exceed one-third of the total estimated expense of carrying out a programme for initial operation, expansion or increased efficiency, and one of the conditions of grant is that members of the co-operative or group must themselves contribute towards the total expense an amount at least equal to the approved amount of grant.

The expenses for which capital is required will vary in different cases but those which may be taken into account in estimating the total expense of the programme may cover such items as equipment, vehicles and containers, and, in some cases, operating costs such as salaries, wages, telephones and electricity, in so far as they have to be met from working capital pending adequate receipt of income from the programmed activities. Such expenses must relate only to the storage, preparation for market and marketing of primary produce and may not extend to operations which are not normally associated with farming.

Centenary of the State Veterinary Service

One hundred years of state veterinary medicine were celebrated on 14th October, 1965, by the publication of a commemorative book entitled *Animal Health—A Centenary 1865–1965*. In this book the Animal Health Division of the Ministry looks back on the substantial achievements in the control and eradication of diseases of animals since the Veterinary Department came into being in October, 1865.

The centenary book contains a wealth of recorded experience which will be of great interest to all veterinarians and agriculturists. Over 40 veterinarians collaborated in its preparation and each deals with a subject on which he is an authority. Apart from telling an absorbing story, the book should become an indispensable work of reference in the field of comparative preventive medicine. The accumulated knowledge gained from a century of State Veterinary Service in Great Britain which it records may well prove of great value to the veterinary departments of other countries in dealing with their own problems of epidemic disease.

The book, which is well illustrated and fully indexed, contains almost 400 pages. It is available from H.M.S.O., price £4 (by post £4 3*s*. 3*d*.) or through a bookseller.

National Grassland Demonstration, 1966

The next National Grassland Demonstration, the first to be sponsored by Shellstar Limited, will be held on 230 acres of the R.A.S.E.'s Showground at Stoneleigh Abbey, Warwickshire, on 24th and 25th May, 1966. In addition to the normal silage and haymaking demonstrations, a number of new features will be included in 1966. Whereas previous demonstrations have concentrated mainly on machinery for cutting and conserving grass, the 1966 demonstration will place more emphasis on the growth and utilization of grass as a crop.

The demonstration will include a silage-feeding experiment. Silage made during 1965, cut early and late, both wilted and unwilted, is being fed to four batches of bullocks. The liveweight gains will be measured and compared, and the four batches will be exhibited together with all relevant data. Another new feature will be the demonstration of the value of nitrogen for grass to be grazed by beef cattle; 15 acres will also be devoted to the paddock grazing of beef animals.

A new exhibit will be the plot scale demonstration of weed-killers for grassland, including those suitable for the new techniques of chemical ploughing. There will also be a demonstration of grass species provided by the N.I.A.B., and the Grassland Research Institute will furnish their latest information relating to the digestible dry matter derived from these grasses.

Controlled Environment

A new book entitled *Controlled Environment* has recently been published by the Electrical Development Association in its series of Farm Electrification Handbooks. The new book collates facts gained from experimental work and practical experience, and includes basic data and design requirements. Details and illustrations of the operation and methods of control of electrical appliances are given. Chapters are devoted to the selection of equipment for specific purposes together with approximate running costs. Information on the precise calculation of ventilation requirements in relation to heating considerations is given together with worked examples. Individual copies of *Controlled Environment* are available free from Electricity Boards and direct from the Association at Trafalgar Buildings, 1 Charing Cross, London, S.W.1.

Books

Ecology of Soil-borne Plant Pathogens. Edited by K. F. BAKER and W. C. SNYDER. John Murray, 1965. £5 5*s*.

This book is the outcome of what might be called, in the current phrase, a 'teach-in' on soil-borne diseases that took place at the University of California in 1963.

Soil-borne diseases cause serious losses in crops, both in temperate and in tropical regions, and their control often poses problems of great complexity. In a glasshouse, soil sterilization by steam or by chemicals is often effective, but this is rarely practical on a field scale. Some familiar diseases (e.g., potato wart disease, hop verticillium wilt and strawberry red core) are controlled in practice by the growing of varieties which are immune to, or little affected by, the disease. Others, like take-all in wheat, are reduced to an 'acceptable' level by crop rotation or other husbandry means. Control measures of this kind are often first discovered empirically and research then helps to explain why they are effective. Altering one factor in a complex ecological system such as exists in the soil may have extensive repercussions, and new methods could be introduced and more diseases brought under control if we understood more clearly how disease organisms survive and spread in soil.

The organizers of this symposium decided that an exchange of views between those familiar with different facets of the problem would lead to a fertilization of ideas and to the encouragement of new lines of research, and thus to fresh advances. They invited specialists from many fields to give papers. These, each with a substantial bibliography, are published here. Some of the contributions are inevitably introductory and will seem elementary to a specialist on that particular topic. No one, however, could read this book without learning something, or without having new light thrown even on topics with which he considers himself familiar.

Most of the contributors—there are over 40 of them—are American, British, Canadian or Australian, but they include so many 'big names' in plant pathology and related fields that it would be invidious to mention individuals.

The first section consists of introductory papers which review our present knowledge of the soil microflora and fauna, and of the survival, growth and dispersal of soil pathogens. Another group of papers deals with physical and chemical factors in soil and roots, and the interaction of these with the microflora. A third group describes recent work on the mechanism of disease production by fungi, bacteria, nematodes and viruses. This leads to a final section which describes biological methods that have been used successfully in controlling some diseases; and discusses the interactions between soil micro-organisms and plants.

The volume is packed with information, and one can but hope that the organizers' intention will be realized and that this series of skilful sketches of the 'trees' will lead to a better understanding of the wood.

Not only is present knowledge summarized, but the more important gaps in knowledge are indicated. Some sections will date rapidly—time has certainly not stood still since 1963—and, although the introductory background chapters will remain relevant, this should not be looked on as a text-book of the usual type. It will be of most use to post-graduate workers embarking on the study of soil-borne diseases, supplying as it does reviews and summaries of current knowledge and a guide to further reading.

Research tends, perforce, to concentrate on specialized aspects of a problem, but the ecology of plant pathogens in soil demands the wider view which is taken in this book. All the papers are good, and some are very good. The editors, in particular, deserve high praise; the writing is clear, there is a competent index, and the work is well-produced and remarkably free from typographical errors.

I.W.P.

Shelterbelts and Windbreaks. J. M. CABORN. Faber and Faber, 1965. 50*s*.

This eminently readable and authoritative book fills a gap in the literature on the subject. It is a comprehensive account

of the provision and effect of shelter in United Kingdom conditions, and Dr. Caborn has drawn on his wide experience here and abroad to cover all aspects of planting shelters for houses, gardens, estates, farms, and market-gardens.

The object of shelter is to ameliorate climatic conditions, and the opening chapter on wind and climate is naturally followed by one demonstrating the value of shelter for various purposes. The success of shelter depends on its siting, shape and constituent trees or shrubs. There is a wealth of information about individual species, their characteristics and usefulness for shelter in different situations. Particularly helpful is the chapter on designing small windbreaks. Nor is the restoration of existing shelterbelts neglected; much can be done to renew their effectiveness, and it is remarkable how our forebears, without the benefit of modern science, very often chose just the right site, shape and type of shelter to fulfil their purpose.

When embarking on a long-term, and perhaps expensive, business such as planting trees and shrubs, it is important that it should be done correctly to achieve the desired effect. This book is a good investment for anyone contemplating shelter planting, whether on a small or large scale. It is well illustrated, a useful appendix summarizes the key to the selection of tree species for different sites, and a table gives planting requirements per acre.

In one interesting pair of photographs, a house in Berwickshire is shown graphically in 1881 and 1948—which effectively proves the aesthetic, as well as practical, value of its sheltering woods. Indeed, there can be great beauty in shelterbelts if they are planned with care and of suitable species; the aesthetic effect is improved because, as Dr. Caborn points out, an irregular profile is more effective in reducing wind eddying than uniform stands of trees.

As shelter planting implies continuance, there should be no period when the ground is clear felled. This is not to say that shelter is incompatible with timber production, but the main purpose of the planting must be sustained and timber taking should never be to the detriment of the shelter.

All readers, whether they are landowners, farmers or simply those concerned with shelter for their homes and gardens, will find their wants catered for in this excellent publication.

R.G.A.L.

Bobby Boutflour. MARY BOUTFLOUR. Crosby Lockwood, 1965. 25*s*.

'Professor Robert Boutflour, C.B.E., M.Sc., Principal of the Royal Agricultural College, Cirencester' was a title and a distinction that Bobby Boutflour could read and reflect on with great pride at the end of a long career in his beloved agriculture. His pride would be justifiably great, but he would have relished, most of all, the fun, the excitement and the friends it had brought him.

Mary Boutflour, herself a sensitive and gifted artist, a devoted wife and mother, has written the tale of a simple man full of boyish ambitions but one endowed with the energy of the atom and a rare wisdom. The life and reminiscences of Bobby Boutflour races like a mountain stream from a beginning in Boutflour's own description of his early life. The seventh child of a family of ten whose father, a master mariner, spent his active life at sea, he found himself involved in work on the home farm from his earliest years.

At the age of 15 he left school and went home as cowman. Here he gained his first personal knowledge of the problems of feeding and milk-production which was to lead him to become a revolutionary and the most progressive figure in agriculture of his time. Like most of us he had a good and encouraging mother. Boutflour describes her quiet but determined authority in preparing him for the future, and her wise persistence that he should have 'another string to his bow', a degree in agriculture. Thus was the first step taken on the road to the College as Principal.

He swept through his studies and, with the spirit and success which always remained with him, he moved from post to post as lecturer in agriculture in Lancashire, district officer for the University of Leeds, agricultural organizer in Lincoln, county agricultural officer in Wiltshire, National Director of Dairy Husbandry, and then to the Royal Agricultural College in 1931.

Four chapters of the book are devoted to the College's early history and Boutflour's problems, efforts, successes and failures up to the outbreak of war in 1939. At this point the Office of Works took possession of the College for housing a Government Department, and Bobby was given 48 hours to get out!

One Chapter only gives a hint of the job which Boutflour says 'gave me more pleasure than any I had ever had'—his colossal attack, as Executive Officer to the War Agricultural Executive Committee in Gloucestershire, on the problem of maximum farm food production from 1939 to

1945. Here he became a leader without parallel. His gifts for extemporization, organization and a Churchillian 'won't be beaten' thrust, swept the county into a heat of activity in which it was proud to be involved.

In 1945 Boutflour returned to the College to begin again. For thirteen more years he lived and served in that which has become a memorial to him. An illness while in retirement led to the death in 1961, at the age of 71, of a man who had left his mark on world agriculture and on all who knew him. Mary Boutflour has provided a friendly, homely book assured of a permanent place on the fireside bookshelf.

T. A. McD.

Profitable Glasshouse Cropping Plans. C. LLOYD and R. J. PERKINS. Manchester University Dept. of Agricultural Economics. Bulletin 108/HI, 1965. 15*s*.

Messrs. Lloyd and Perkins have taken a theoretical one-acre glasshouse unit and, using a typical Lancashire cropping system of tomatoes, lettuce and chrysanthemums, have examined the effects on profits of different combinations of these crops when the labour force and heated to cold glass ratios are varied.

Each crop has been subdivided according to planting and marketing date, and when several periods and methods of soil sterilization are also considered, the number of possible activities builds up, rather surprisingly, to 138.

With a different glasshouse space requirement, labour inputs and gross margin for each activity, the problem of selecting the most profitable plan becomes so enormous that linear programming, an operational research tool involving the use of an electronic computer, becomes essential.

The application of this method, which is sometimes used for industrial or agricultural problems of profit maximization or cost minimization, has produced a series of cropping plans which give the maximum profit for each situation. The number of men employed and the heated to cold glass ratio are varied, and the computed plans have total gross margins of from £4,648 to £7,643 per acre. From this, the common costs and varying costs of labour and capital depreciation must be subtracted to find the Net Income. (The authors rather unkindly give us a new and imprecise term to add to the collection: 'gross profitability'.)

More important than the plans themselves which produce these widely varying results, are the ways in which the plans change from situation to situation, and the authors' discussion of the economic implications of these is very enlightening. The thoroughness of their treatment may put some readers off, and it must be stressed that this is not casual reading. It is almost a working manual of linear programming, and this aspect makes it a valuable publication for the research worker.

To the advisory officer, grower or student who is particularly interested in management techniques, it will offer much in return for careful reading. However, it might have been better if more had been put into the Appendix. Pages 10 to 20, for example, do not make interesting reading, and detract from the main issues. Apart from that, the style is lucid and the presentation is excellent.

A.W.H.

Management and Milk Production. G. ALLANSON. Wye College Department of Agricultural Economics, 1965. 5*s*.

Management and Milk Production is a fascinating discourse on dairy farming, which does not attempt to be a text-book or to provide concrete solutions to the problems it raises. In the space of 50 pages, the reader has brought before his eyes a view of the present and future structure and problems of the dairy industry, and a variety of ways by which dairy farmers have improved their position, or may do so. Though encouraging for some, it may be painful for those who wish for a quieter life to find that the main message of the book is that forceful management can win the day. While no one system or approach is necessarily the best, even on one particular farm, good management can make a good system work. It also means that the current system is continually reviewed and modified as necessary in order to maintain a competitive position. But, at the same time, it is an important fact that many decisions, once implemented, cannot be easily or profitably reversed.

One of the most interesting sections of the report is an analysis of the effect of weather on harvesting hay with different combinations of machinery. Haymaking is a risky business, and the author shows ways of measuring the risk and combating it.

As in all thoughtful essays, several areas of needed research are thrown up. One of these, the 'price mapping' of typical farms to show the range of prices

and conditions under which particular types of dairy and whole farm organization are most profitable, seems to offer particular scope for advance. This has already been done for an arable type of farm by Barnard at Cambridge, and it seems likely that an extension of this kind of work would pay dividends by saving the resources in giving management advice on individual farms, and by working out for policy makers the degree of stability and likely direction of adjustment of the dairy industry under different price regimes.

The rapid style of the report makes it extremely readable, though sometimes at the expense of a lack of conclusiveness or authority. But it is clear that much practical experience, reading and research have gone into it, and it should be welcomed as providing illumination of many aspects of the current problems and future possibilities of dairy farming.

G.H.W.

Game and Shooting Crops. ELEY GAME ADVISORY SERVICE BOOKLET No. 2, 1965.

This is one of 16 Game Advisory Booklets available free of charge from the Station at Fordingbridge, Hampshire.

The maintenance of adequate game stocks has always been important—and lucrative—even during the years when farming was unrewarding. Indeed, it was not unknown for some farms to be more highly regarded for their sporting rights than for their husbandry, and some estates were managed primarily for their sporting value. But those days have passed and both farming and landowning have now to be regarded as businesses. Yet, when farming is prosperous and land values are high, there is still a buoyant demand for good shoots. Syndicates or individuals quickly take up any shooting available and a newcomer to an area does not find it easy to rent a bit of shooting. From the price of a gun on a grouse moor at several hundreds a season to a few pounds for the right of walking-up such game as can be found on a rough shoot, there are plenty of takers. A landowner or a farmer can, without undue disruption of farming plans, develop, if he will, a useful shoot on his land, either for his own enjoyment or as a source of additional income. With a little care, some excellent sport can be provided on even relatively small areas.

This excellent booklet, well written and illustrated, shows that some crops or plants can be put down in suitable sites, linked with farm crops, to encourage the increase of game birds, particularly pheasants and partridges. If there is marshland or water, much can be done to encourage wild duck. It is not necessary to interfere excessively with the normal farm cropping plan but, as the booklet suggests, patches or strips of a wide variety of suitable crops can be deliberately provided and bring satisfactory results. Many such crops are described—chicory, clovers, cocksfoot, artichokes, lucerne, maize and lupins, to mention only a few—and there is a particularly informative section on the use and value of kale as a game crop. All this shows that the booklet has been written by men who know what they are talking about. They do not discount the value of ordinary farm crops and are careful to remind us that mangels are still one of the best crops for partridge driving.

If you shoot and do not farm, this booklet will tell you much on where you may expect to find game. If you farm and shoot, you will find many interesting sidelights on your farm crops, and it might perhaps tempt you to experiment with some patches of 'game crops'.

R.G.A.L.

Books Received

Pipeline Milking in South-West Scotland. Farm Labour Studies No. 9. Research Bulletin No. 35. R. Turner and R. D. Murray. Economics Department, West of Scotland Agricultural College, 1965.

Contemporary Problems in the Economics of Agriculture—1964. International Journal of Agrarian Affairs, Vol. IV, No. 6. August, 1965. Oxford University Press. 10*s.* 6*d.*

The Use of Concrete Staved Silos for Storing High-Moisture Barley. Experimental Farm Buildings Report No. 4. H. J. M. Messer, J. M. Hill, R. Whittenbury and J. Lacey. Agricultural Research Council, 1965. 3*s.* 6*d.*

Documentation in Food and Agriculture, No. 71. Co-operative Research to Improve Input/Output Data in Cow Milk Production. Organisation for Economic Co-operation and Development, 1965. 15*s.*

Documentation in Agriculture and Food, No. 75. Geographic and Occupational Mobility of Rural Manpower. Organisation for Economic Co-operation and Development, 1965. 9*s.*

Seasonality of Milk Production and Milk Yields from Grazing. J. A. Langley. Department of Agricultural Economics, University of Exeter, 1965. 3*s.* 6*d.*

Agricultural Chemicals Approval Scheme

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Hyvar X Bromacil Weed-killer—Pan Britannica Industries Ltd.

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Berk Turf Weed-killer – Super—F. W. Berk and Co. Ltd.

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'P.P.' Slug Pellets—Plant Protection Ltd.

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OFFICIAL APPOINTMENTS

FEDERAL LAND DEVELOPMENT AUTHORITY MALAYSIA

(1) DIRECTOR, TECHNICAL OPERATIONS DEPT.

Duties: To plan and prepare all project proposals of F.L.D.A.; to determine scope of agricultural research and work required for agricultural development and land settlement.

Qualifications: B.Sc. (preferably D.Sc.) in Agricultural Science, with wide experience in planning and execution of large-scale agricultural projects for land reform or resettlement. Previous experience with International Agencies an advantage.

(2) AGRONOMIST

Duties: To be responsible for agronomic experimentation on the growing of rubber, oil palm, fruits and tobacco; planning, supervision and analysis of field experiments; general advisory work, including use of fertilizers and conservation techniques; and training and supervision of local staff.

Qualifications: A good degree in general Agronomy or Crop Sciences or an equivalent degree in a Biological Science and experience in tropical crops.

Salary: (1) In the region of £3,250 a year; (2) in the region of £2,400—£2,800 a year. Both subject to British Income Tax, plus a variable non-taxable foreign service allowance of £445 (single), £950 (married unaccompanied) or £1,395 (married accompanied) a year. Outfit allowance. Passages provided. Quarters available. Two to three year contract. Generous paid leave.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should write for further details giving full name and brief particulars of qualifications and experience quoting for (1) RC 213/106/07 and for (2) RC 213/106/010 to:

Appointments Officer,
Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House, Stag Place,
London S.W.1.

PLANT PATHOLOGIST

MALAWI

Required to identify diseases of crop plants and to undertake advisory work on control measures, including some research work into those diseases of major importance.

Candidates should hold an honours degree in Natural Science with Plant Pathology or Botany as a major subject. Some post-graduate work in Plant Pathology is desirable.

Salary: £1,485—£2,600 a year plus 15% terminal gratuity. Passages provided. Education allowances. Government quarters. 2–3 year contract.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should write for further details, giving full name and brief particulars of qualifications and experience, quoting RC/213/134/010 to:

Appointments Officer,
Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House, Stag Place,
London S.W.1.

SCIENCE EDITOR (CROPS)

GHANA

Required to edit the Ghana Crops Science Journal, to review some past work for circulation and to train an understudy.

Candidates must hold a good science degree and have a good knowledge of crop science editorial work with experience on an agricultural or science journal. A knowledge of French is essential.

Salary range £2,250—£2,500 a year, subject to British income tax plus a tax-free overseas allowance ranging from £920 to £1,830 a year, according to domestic circumstances. Passages provided. Education allowances. Contract post for two tours of 15 to 18 months.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should write for further details giving full name and brief particulars of qualifications and experience, quoting RC 213/70/03 to:

Appointments Officer,
Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House, Stag Place,
London S.W.1.

OFFICIAL APPOINTMENTS

LIVESTOCK IMPROVEMENT OFFICER
KENYA

Applications are invited for the post of Livestock Improvement Officer to supervise the breeding programme of the National (Sahiwal) stud and to carry out field trials and research in nutrition and management under the direction of the Chief Veterinary Research Officer.

Candidates, who should normally be nationals of the United Kingdom or Republic of Ireland, should possess a degree in Veterinary Science or an honours degree in Agriculture, with extensive experience in livestock breeding and animal husbandry.

Salary in scale of £1,374 to £2,757 per annum (entry point determined by qualifications and experience), plus 25% terminal gratuity. Free passages. Quarters available. Two year contract.

Please apply for further details giving full name, qualifications, experience and quoting Ref. RC 217/95/012 to:

Appointments Officer,
MINISTRY OF OVERSEAS DEVELOPMENT,
Room 301,
Eland House, Stag Place,
London S.W.1.

AGRICULTURAL ECONOMIST
BECHUANALAND

Required to undertake a sample survey of the system of agriculture at present practised by Farmers in the Pupil/Master Farmer Scheme and also of those not participating in the scheme and to investigate the economics of ranching, arable/ranching and irrigation farming.

Candidates must possess a degree in Agricultural Economics and have previous experience of African tropical agriculture.

Salary range £2,500 to £3,000 a year, subject to British income tax, plus a variable tax-free overseas allowance ranging from £235 to £720 according to marital status. Salary calculated according to qualifications and experience. Education allowances. Passages and accommodation for officer and family. Medical attention to N.H.S. standard. Two year contract.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should write for further details, giving full name and brief particulars of qualifications and experience, quoting RC. 213/19/09 to:-

Appointments Officer,
Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House,
Stag Place,
London, S.W.1.

PUBLIC SERVICE OF TASMANIA, AUSTRALIA
AGRONOMIST, DEPARTMENT OF AGRICULTURE

Applications are invited for appointment to a position as Agronomist, in the Agronomy Division of the Department of Agriculture, Tasmania.

Location: Launceston.

Salary range:

Class V	£A1563—£A114—£A2019 per annum (3 year degree)	
	£A1677—£A114—£A2019 per annum (4 year degree)	
Class IV	£A2130—£A114—£A2358 per annum	
Class III	£A2472—£A114—£A2586 per annum	

Commencing salary will be according to qualifications and years of experience, and will be payable from date of embarkation for Australia. Opportunities exist for advancement to higher posts.

Duties: To carry out a programme of research work into all aspects of forage crop production and utilisation. Includes species and varietal testing and improvement; determination of fertiliser requirements.

Qualifications:

Degree in Agricultural Science or equivalent faculty.

Appointment at Class IV requires at least 4 years and at Class III at least 7 years' experience since qualification.

Passages from the United Kingdom are provided under the Commonwealth Migration Scheme, arranged through the Agent General for Tasmania.

Recreation leave, sick leave and long service leave are provided.

Superannuation is compulsory for permanent officers.

Applications, in duplicate, should be addressed to the Agent General for Tasmania, 457 Strand, London W.C.2.

OFFICIAL APPOINTMENTS

IRRIGATION AGRONOMISTS
TANZANIA

Required to plan the agricultural aspects of irrigation developments in co-operation with Irrigation Engineers, with particular reference to cropping programmes, and to superintend the management of, and conduct trials on, village irrigation schemes. These posts are vital to the implementation of village irrigation development and provide considerable scope for initiative and enterprise.

Candidates should possess a degree in agriculture followed preferably by post-graduate studies in water/plant relationship, plus 3 years' experience in irrigation farming practices.

Salary scale £1,641—£2,757 a year plus 25% terminal gratuity. Passages provided. Education allowances. 21–27 months contract. Generous leave. Government quarters.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should apply for further details giving full name and brief particulars of qualifications and experience, quoting RC 213/173/014 to:

Appointments Officer,
Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House, Stag Place,
London S.W.1.

SOIL CONSERVATIONIST
GAMBIA

Required to organise and establish an investigational programme on an applied level, developing soil conservation techniques at main or mixed farming centres and farms, using mainly simple ox-drawn equipment and to train extension staff in this work.

Candidates should hold a degree or a National Diploma in agriculture and have field experience in soil conservation work. Experience in mixed farming and general extension work, preferably in Africa desirable.

Salary scale £1,140—£2,224 a year plus 25% terminal gratuity. Salary to be calculated on the basis of one increment for each year's approved experience. Passages provided. 18 to 24 months contract. Education allowances. Generous leave. Government quarters.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should write for further details, giving full name and brief particulars of qualifications and experience quoting RC. 213/68/05 to:-

Appointments Officer,
Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House,
Stag Place,
London, S.W.1.

AGRICULTURAL ECONOMIST
WEST PAKISTAN

Duties: Preparation, scrutiny and co-ordination of development plans, appraisal and evaluation of projects, compilation of periodical evaluation and progress reports, preparation of feasibility reports for different development projects.

Qualifications: Degree in Agricultural Economics with background knowledge and experience of development plans and evaluation projects.

Salary: in the range of £2,500 to £3,000 a year, subject to British Income Tax, plus a variable tax-free foreign service allowance of £610 (single), or £1,120 (married unaccompanied) a year. Passage provided. Education allowances. Furnished accommodation. Generous leave.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should apply for further details giving full name, qualifications and experience, quoting RC 213/137/02 to:

Appointments Officer,
Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House, Stag Place,
London S.W.1.

OFFICIAL APPOINTMENTS

AGRICULTURAL OFFICER (ECONOMIST)
MALAWI

Required for the collection and correlation of socio/economic data relating to local farming practices and systems and the planning and execution of sampling surveys on the main food and cash crops, including the interpretation of results by appropriate statistical techniques.

Candidates must possess a university degree in general agricultural economics.

Salary scale £1,485—£2,600 a year plus 15% terminal gratuity. Passages provided. Education allowances. Government quarters. 2 to 3 years' contract.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should write for further details, giving full names and brief particulars of qualifications and experience, quoting RC 213/134/07 to:

Appointments Officer,
Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House, Stag Place,
London S.W.1.

SENIOR AGRICULTURAL ENGINEER
UGANDA

Duties: To supervise a research and investigation programme into the use of tractors and agricultural implements and to be a professional adviser on mechanical cultivation to the Commissioner for Agriculture.

Candidates must hold a degree in agricultural engineering plus at least one year's post-graduate training with considerable experience of testing tractors and agricultural implements, preferably under tropical conditions.

Salary scale £2,814—£3,000 a year.

Passages provided. Government quarters. Education allowances. Generous leave. 21 to 27 months contract. 25% gratuity.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should apply for further details, giving full name and brief particulars of qualifications and experience, quoting RC 213/183/018 to:

Appointments Officer, Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House, Stag Place,
London, S.W.1.

BRITISH TECHNICAL ASSISTANCE
ADVISER ON AGRICULTURAL PLANNING, BRAZIL

Duties: To assist with general agricultural planning and to advise on methods to increase production.

Qualifications: Degree in Agriculture with preferably a Diploma in Tropical Agriculture and wide experience of agricultural planning and development under tropical and sub-tropical conditions. A knowledge of Portuguese would be an advantage.

Salary: Probably of the order of £4,500 a year, according to the qualifications and experience of the selected candidate, subject to British Income Tax, plus a variable non-taxable foreign service allowance of £530 (single), £825 (married unaccompanied) or £970 (married accompanied) a year. Entertainment allowance £250 p.a. Education allowances. Passages provided. Accommodation available. 12 months' contract.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should write for further details giving full name and brief particulars of qualifications and experience, quoting RC. 213/23/04 to:-

Appointments Officer,
Room 301,
MINISTRY OF OVERSEAS DEVELOPMENT,
Eland House,
Stag Place,
London, S.W.1.

ECOLOGIST
MALAWI

Required to conduct small scale surveys of development projects, and to extend the agro-ecological survey of the whole country; also to supervise the herbarium.

Candidates, preferably single on account of travelling involved, should hold a B.Sc. degree in Natural Science, of which Botany should be one subject, and have knowledge of plant taxonomy.

Salary £1,485—£2,600 a year plus 15% terminal gratuity. Passages provided. Education allowances. 2–3 year contract. Government quarters.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should write for further details, giving full name and brief particulars of qualifications and experience, quoting RC 213/134/04 to:

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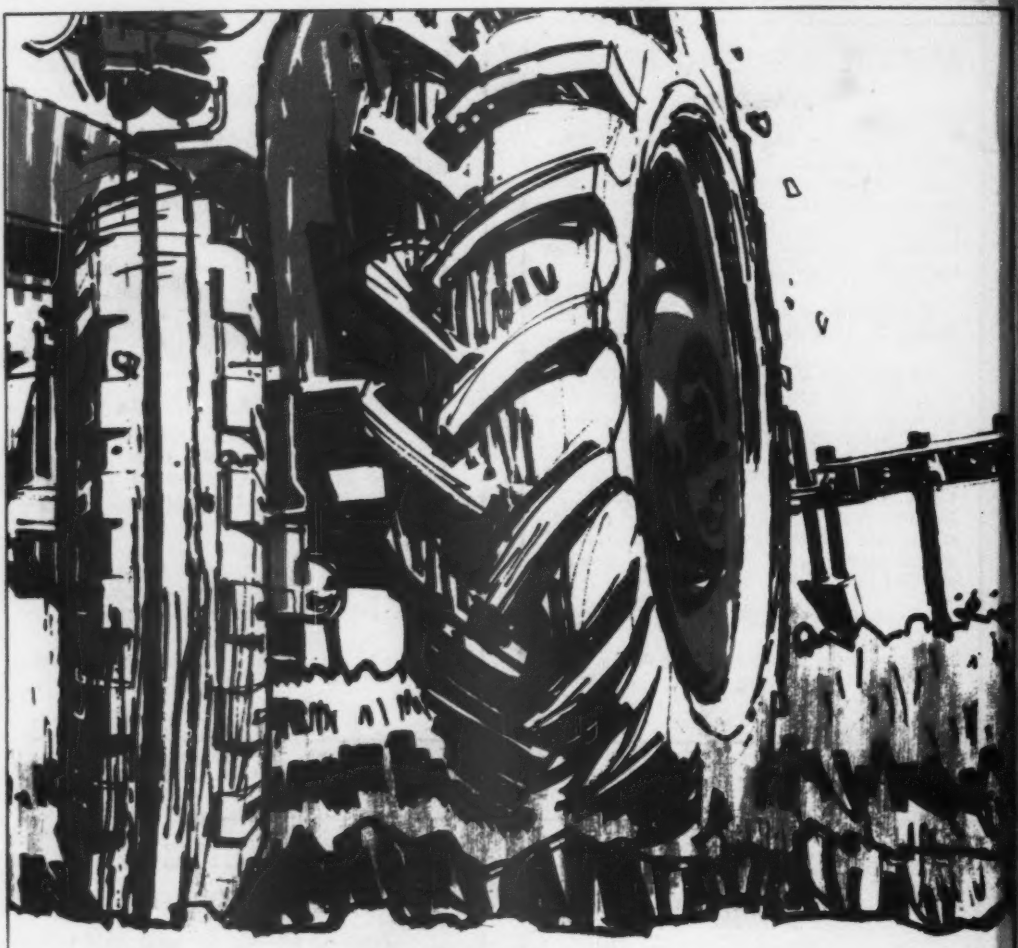

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